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Full-on desktop power you can hold in your hand! PG. 53

MAXIMUM PC

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THE CHEAPSKATE'S GUIDE TO POWER COMPUTING

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- Pointers to the best deal sites
- A guide to free and cheap digital content
- Instructions for building a $600 PC
- And so much more!

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We review six high-performance planks PG. 40

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MAXIMUM PC

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Future plc is a public company quoted on the London Stock Exchange.

www.futureplc.com

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Gordon
Mah Ung

YOU REALLY DO LIKE US

THIS YEAR'S CES was an encouraging sign for any supporters of the PC. The gadget and mainstream tech press, who usually dismiss the PC as being less useful and less desirable than a typewriter, packed a good-size room just to see Gabe Newell of Valve introduce 13 PCs made for playing games with the upcoming SteamOS. I also met with more than a dozen PC and PC component vendors who all seemed very upbeat about the PC's future and their ability make money off of it.

The PC's Sally Field moment really came to me when I sat down with Intel vice president Lisa Graff, who is now in charge of the Desktop Client Platforms Group. That means she's the person calling a lot of the shots on the fate of the desktop PC, which makes her a very important person at Intel, and to us. So, what did Graff say to make us think of Sally Field's "You like me. You really like me!" moment?

"PC enthusiasts are important to Intel."

That statement alone was enough to floor me because, frankly, we haven't been feeling the love from Intel over the last few quarters. The company has seemingly been laser-focused on mobile phones and tablets. And as much as I didn't want to acknowledge it, there has been a gnawing fear that Intel would toss us aside without a moment's notice.

Graff even acknowledged that the company hasn't done everything it could to keep enthusiasts happy of late, but she claimed that's changed, and Intel—the world's largest chip company, I will remind you—will do all it can to keep PC enthusiasts happy and, of course, buying more hardware.

Yeah, I know. The cynics among you are rolling your eyes like a slot machine because you've heard this all before. One jaded PC vendor I spoke with after my meeting pointed out that walking Intel's gigantic booth at CES you wouldn't even know that Intel makes CPUs that fit into that dinosaur known as the desktop PC.

That's true, but acknowledgement is the first step in the right direction. Graff said that there are good things on the radar for enthusiasts that will be made public once the time is right.

As always, we will withhold judgment until we see these good things, but just hearing someone say that the PC enthusiast is important is enough to keep hope alive.

Gordon Mah Ung is Maximum PC's deputy editor, senior hardware expert, and all-around muckraker.

↘ submit your questions to: comments@maximumpc.com

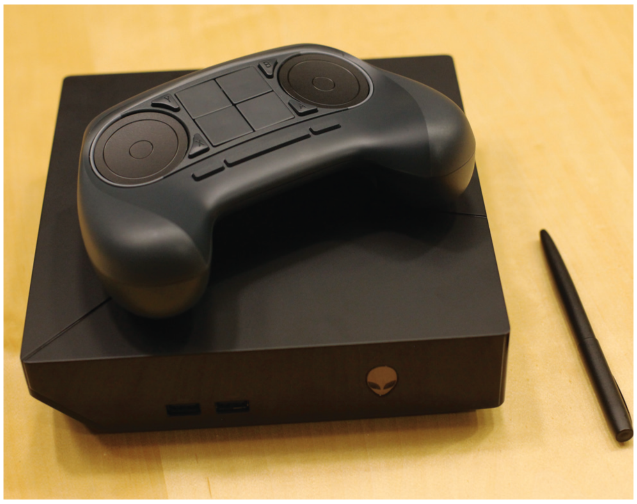
THE NEWS

Hardware Vendors Line Up Behind SteamOS

Questions still linger about the viability of Steam Machines

IF THERE WAS any doubt about the excitement level around Valve Software's upcoming SteamOS, it was erased at the Consumer Electronics Show in early January, when the company highlighted no fewer than 13 hardware vendors who have pledged to offer Steam Machines based on Valve's Linux-based operating system for gaming.

In front of a packed room of journalists from around the globe, Valve CEO Gabe Newell unveiled PCs of all shapes, sizes, and prices that will one day—at a time still to be determined—run the company's nascent SteamOS.



Alienware's tiny Steam Machine will pack an Intel CPU and Nvidia graphics and will cost $500 with a controller. (Pen is for scale.)

"My favorite statistic [about PC gaming] is that Dota 2 is bigger than Monday Night Football," Newell said. In fact, there are more than 65 million Steam accounts, with 6 million people using the platform at any moment. While Valve is but one developer, its online store is the number one choice for PC gaming, which practically makes Newell the pastime's ambassador. And it's PC gaming that Newell says he's trying to preserve *and* expand with SteamOS.

Newell continued, "Now, a couple of years ago, we started to get pretty worried that maybe that openness was going to be challenged—that there was success in proprietary platforms in the living room and in mobile, and that that was going to cause our entire industry to step away from the opportunity of openness. We started to think, 'What can we do?' There are lots of people who can take on this challenge, but what are some of the pieces that Valve could try to help with?"

The answer was SteamOS, which today is pretty much a Windows-free way to run Steam's Big Picture mode in the living room. But rather than laying out specific hardware specs, such as minimum and maximum recommendations, Valve is leaving it to PC vendors to decide what to do.

"There's a lot of variation [in Steam Machines], low-end to high-end, both in the devices you see here and in product lines that people are going to have," Newell said. "That's one of the strengths that the PC has. Customers can get the experience they want, while software developers can be guaranteed a stable platform for delivering value."

The fact that 13 hardware vendors—including Alienware, CyberPower, Digital Storm, Falcon Northwest, iBuypower, Origin PC, and Maingear—would sidle up to the SteamOS trough shows the support and sway Valve has in the industry today.

Still, there are many questions that linger, such as when the OS will actually be ready, when hardware will actually be for sale, and how much Valve's own revolutionary but incomplete gamepad controller will cost.

Hardware partners we spoke with estimated that their Steam Machines would be available in the second or third quarter of this year. Some were concerned that hard information and sample controllers haven't exactly been forthcoming from Valve, even though Valve has shipped 300 prototype units and controllers to beta participants.

That's not exactly a surprise. The privately owned Valve has long been known for being incredibly secretive and almost eccentric in its handling of the outside world, as well as working on "Valve Time" with projects like Half Life 3. This time, however, the company is dragging along more than a dozen PC vendors, and there's still been no response from the Bellevue, WA–based company's neighbor in Redmond, which can be quite protective of its hardware-partner turf.

–**Gordon Mah Ung**

Lian-Li Unveils Desk-Shaped Case Prototype

In January, case manufacturer Lian-Li revealed the DK01 chassis, which looks like a desk with a computer case built into it. We've seen a couple of similar ideas floating around lately, but none as streamlined as this one. Since this unit is a prototype, its specs could change by the time you read this, or Lian-Li may decide not to sell it. But for now, it's about 32 inches wide, 31 inches tall, and 24 inches deep. The surface of the desk can be glass or acrylic. Inside, it has space for over a dozen 3.5-inch drives, an E-ATX motherboard, 16-inch video cards, and seven 120mm fans. Price and release date have not been announced. **–PL**

Incoming: Gigabit Internet over Phone Lines

The International Telecommunication Union (ITU) has announced that it's begun work on G.fast, which would allow gigabit Internet speeds over conventional copper wire, according to tech website Extremetech. In real-world applications, you would probably max out at around half that speed, since there would be signal overlap with FM radio, and residential copper wiring is susceptible to line noise and cross-talk. G.fast also wouldn't be usable past about 250 feet. However, that last stretch from the street cabinet to the computer in your home is by far the most expensive leg of the journey. As long as there's fiber running through the neighborhood, G.fast could become a competitive alternative to cable Internet and current DSL offerings. **–TM**

Puget Systems Talks Hardware Reliability

In late December, boutique PC builder Puget Systems produced its annual list of the most reliable hardware, which is based on the company's testing procedures for determining which hardware vendors it wants to work with. (Puget writes a regularly updated blog about various aspects of PC hardware and building.) The company said that motherboards are the most failure-prone of any component, with one out of every 25 units being DOA. Only four boards it looked at were error-free. Two were Asus workstation boards, and the others were the MSI FM2-A75IA-E53 and the Asus F2A85-V Pro. Puget also said that Kingston produces the most reliable RAM that it's tested so far. You can check out the full blog post here: http://bit.ly/1lQ04KQ. **–PL**

Puget Systems

Tom Halfhill
Fast Forward

DUMB TERMINALS LOOK SMARTER

GOOGLE'S LOBOTOMIZED Chromebooks are surprisingly popular. Last year, according to NPD market analysts, 21 percent of the notebook PCs sold were Chromebooks, and they're outselling Apple's notebooks by five to one. The only hotter products are tablets.

I half-jokingly call them "lobotomized" because they aren't full-featured computers. Mainly, they run web-based applications and store data files in the cloud, although they also have limited offline capability. In effect, Chromebooks are the latest incarnation of dumb terminals—the primitive time-sharing video screens and keyboards attached to early mainframes and minicomputers. In the 1990s, Sun Microsystems revived the concept as "network computers" or "thin clients" that ran Java applications from websites or a small local drive.

Most thin clients flopped, but Chromebooks look more viable. For all we love about conventional PCs, they're still a pain in the ass. Even power users struggle to maintain them and protect them from buggy software and intrusive malware. Businesses waste billions of dollars on IT support. All of us reading this magazine are probably the first-call help desk for our family and friends.

Of course, Chromebooks aren't for everyone, but they're a godsend for casual users and many office workers and students. Power users may prefer them over a tablet for occasional use. As I predicted long ago, when broadband Internet access becomes as universal and reliable as electricity, the objections to network-centric computers fade away. Yes, a broken network connection cripples them, but many tasks require Internet access anyway. For some folks, network dependency is a fair trade for easier maintenance and (potentially) greater security.

Tablets have proved that a personal computer needn't be onerous to maintain and use. Chromebooks are basically Linux tablets with keyboards. It's time to terminate the snobbish prejudice against "dumb terminals." This concept won't die, because simplicity simply makes sense.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report.*

Thomas McDonald
Game Theory

THE CITIZEN KANE OF INTERACTIVE FICTION

THE PAST few years have seen titles like Proteus and Dear Esther pushing the boundaries of interactive narrative. I didn't like either of those games, but that's not the point; their creators were willing to kick at the boundaries of tech and gameplay to create new moods and experiences. Being the first is never easy. For every D.W. Griffith who writes a new language for an art form, there's an Orson Wells to come along and make that language sing in previously unimagined ways.

And the creators of The Stanley Parable have done just that. It takes the "first-person walker" (FPW) genre and turns it into a dizzying, brilliant commentary on games and gamers, individuality and conformity, and the relationship between designer and player. It may just be a souped-up choose-your-own adventure tale, but it's unrelentingly clever, overflowing with ideas, jokes, hairpin mood shifts, and narrative jolts, all of it adding up to a striking meta-commentary on the process of making and playing games.

From the moment the narrator (one of the best written and performed pieces of voice acting since GLaDOS) tells you to take the left door, and you take the right, you begin to shape the tale through myriad endings and beginnings. The "good," conventional ending is the least interesting, while the odd, sometimes surreal, often hilarious "wrong turns" are endlessly fascinating. At one point, you find yourself in the game playing Minecraft and Portal.

The creators of this Chinese puzzle box understand gamers, and they're fascinated by the strange relationship that forms between an individual and a virtual environment with its own telos and its own rules. It probes the illusion of choice in a constructed space, yet oddly enough, the only people who will get the joke are those who routinely surrender to the very tropes being mocked by the designers. That's not just meta. That's meta^3.

Thomas L. McDonald is
Editor-at-Large of Games Magazine.

Oculus VR Starts Game Publisher Department

Crystal Cove Prototype
Oculus

Oculus VR, designers of the Oculus Rift head-mounted display, has announced the creation of a department within the company specifically for coordinating with game publishers and studios. It's headed by David DeMartini, a veteran of Electronic Arts who worked his way up to senior vice president before leaving the gaming giant. He told website Gamasutra.com, "I'm figuring out how to partner effectively with big developers, small developers, all the way down to the individual who just wants to make something great for the Rift." From this, we might assume that Oculus VR will not be developing its own games. At press time, the company had not yet committed to a specific price or release date for its device. **–BV**

Windows XP Finally Dwindling

In late December, two data research companies shared some interesting stats on Windows XP. NetMarketShare reported that XP was installed on fewer than 30 percent of PCs, while StatCounter estimated it at fewer than 20 percent. This indicates an accelerated transition toward Windows 7 and 8. Microsoft is finally dropping support for XP in April, which is the likely cause of this shift. The OS came out in October 2001 and has enjoyed unexpected longevity, thanks to Windows Vista's troubled public image. A few third-party companies have stepped up to offer security patches after Microsoft stops doing so, though how they plan to do that without access to the OS's actual source code remains to be seen. **–PL**

Tech Tragedies and Triumphs

A monthly snapshot of what's up and down in tech

TRIUMPHS

+ **4K PANELS**
This month, we saw the rollout of the first sub-$1,000 4K LCDs. Sadly, they are all TN panels.

+ **STEAM**
The online service hosted a record 7.6 million concurrent users in December 2013. It has 65 million total users.

+ **INTEL WHIZ KID**
16-year-old Joey "marshmallow cannon" Hudy became the youngest intern ever hired by Intel. Maybe he'll be our intern next.

TRAGEDIES

− **MCAFEE**
Intel has dumped the notorious brand name in favor of "Intel Security." Gee, we wonder why.

− **RADEON R9 290 CARDS**
For the past month, these cards have been impossible to purchase—thanks, coin miners!

− **AMD MANTLE PATCH**
The highly anticipated Mantle update for BF4 is on indefinite hold while Dice sorts out the game's issues.

Quinn
Norton
**Byte
Rights**

WAR IS PEACE, VULNS ARE NATIONAL SECURITY

THE END OF 2013 was rocked by revelations that the NSA had weakened crypto standards and inserted backdoors into security software, news that Americans greeted by cocking their heads like a confused dog watching television. In fact, this has been one of the most shocking of the Snowden revelations, but it's hard to immediately see why. Part of it is that maybe the agency shouldn't spy on everyone on the planet, but the other reason is that weak standards and backdoors can never be just for the NSA, especially given how good it's been at keeping its secrets.

Hostile governments, organized crime, hacking groups for hire, or even quiet bands of malevolent mathematicians can and probably have found these weaknesses, compromising the security of innocent people whom the NSA has no interest in, or in protecting. This crypto doesn't just protect banks. It protects medical records, shipping, travel, and all kinds of critical infrastructure the world over.

This is terribly wrong, and signs of an agency out of control, because the NSA has two missions. One is the well-known "spy on everyone in the world as much as possible" mission, staffed by thousands, aided by federal contractors, and so well-funded that they have to shovel money they can't spend fast enough into the Potomac. But the other mission is to cryptographically secure American infrastructure, which we can presume is five depressed guys in a basement facing the world's worst adversary: the rest of the NSA.

Whatever its intentions, weakening your own infrastructure is clearly insane, reminiscent of East German Stasi laws that made all door locks weak enough so they could break into any house. The government's excuse for making everyone more vulnerable? National Security—an Orwellian masterstroke. The NSA won't stop this insanity, and why should it? Any attack would just confirm our need for the agency.

Quinn Norton writes about copyright for Wired News and other publications.

Linksys Resurrects the WRT54G

Back in December 2002, when cable had one HD channel and the Boston Red Sox were lovable underdogs, networking hardware manufacturer Linksys debuted the WRT54G, an 802.11g wireless router. The device "just worked" to a degree that users had not seen before, and it remained highly reliable and operational for years. As Linksys attempted to transition the user base to new products, loyalists remained steadfastly glued to the WRT54G, to the point of tricking the router into running custom versions of Linux to keep its features up-to-date. Linksys eventually moved on to other things, got bought out by Cisco, who eventually sold it to Belkin, and the WRT54G gradually faded away as people upgraded to 802.11n, USB ports, and other features.

But Linksys has not forgotten those days, and it has announced that it's resurrecting the WRT54G, at least in spirit. This new device, known as the WRT190AC, uses the same familiar blue-and-black color scheme and stackable design. But, as the model name implies, it's been upgraded to 802.11ac, the fastest Wi-Fi speed on the market. Also under the hood is a dual-core ARM chip, 128MB of flash memory, and 256MB of RAM. Compare that to the WRT54G's 2–8MB of flash and 8–32MB of RAM (depending on the model), and you can see the possibilities. Linksys also promises Linux support out-of-the-box, whereas support for that on the WRT54G ranged quite a bit from one version to another. The 1900AC will even have a USB 3.0 and eSATA port. The $300 price tag, however, may not be so popular when it launches this spring. **–TM**

LINKSYS
LINKSYS
LINKSYS
LINKSYS
WRT 1900 AC
POWER
INTERNET
2.4 GHz
5 GHz
eSATA
USB 1
USB 2
1
2
3
4

Haswell-E Coming This Year

Intel has announced that its next generation of LGA2011 CPUs will arrive in Q3 of 2014. This workstation-grade chip, dubbed "Haswell-E," will sport eight cores, a DDR4 controller, and native USB 3.0. Unfortunately, it will not be compatible with current LGA2011. Instead, Intel will release the "X99" motherboard chipset alongside the processor. Tech website Digitimes estimates that the initial batch of processors will hover around the $1,000 mark. As its name indicates, Haswell-E will use a 22nm process, and we're told that it will have "X" and "K" variants, as before. Intel has not discussed power consumption, but that's expected to be lower, as well. **–TM**

PC Builder Accepting Bitcoins

Boutique system builder Xidax announced in January that it will begin accepting Bitcoins as a form of payment, making it the first company of its kind in the United States to do so. In a statement, Xidax executive operations officer Zack Shutt said that many customers had asked about being able to use the volatile cryptocurrency, and the company was excited to try it out. Bitcoins have skyrocketed in value since their debut in early 2009, with a single coin worth $842 as this issue goes to press. However, this is down from a recent high in four digits, so it remains to be seen if Xidax's initiative will be successful in the long term. **–PL**

THE LIST

THE 10 COOLEST THINGS WE SAW AT CES 2014

10

CYBERPOWER BATTLE BOX

No PC Gamer likes lugging around their desktop to LAN parties—CyberPower addresses that with its handy lunch-box-like PC.

CYBERPOWERPC

9

GIGABYTE BRIX GAMING PC

Gigabyte's Brix Gaming PC will squeeze mobile graphics from either Nvidia or AMD into its tiny NUC-style chassis.

8

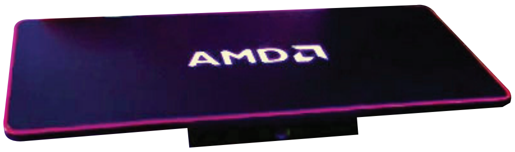
AORUS X7 GAMING LAPTOP

You typically give up graphics performance with thin notebooks, but Aorus aims to fix that with its X7, packing two 765M GPUs while keeping the chassis super slim.

7

AMD NANO PC

Speaking of thin, AMD's Nano HTPC is slim enough to carry in your pocket. The unit we looked at was equipped with AMD's Mullins APU, 2GB of RAM, and 256GB of storage.



6

ASUS 28-INCH 4K MONITOR

Until recently, 4K monitors cost an arm and a leg, but with Asus announcing its $799 PB287Q display, you shouldn't have to sell your kidney to enjoy UHD content.

5

PRIOVR SUIT

The Oculus Rift is undoubtedly cool, but we won't get true VR until we can control games with our bodies. Enter the PrioVR: a spiffy suit that accurately tracks your limbs.

4

CRYSTAL COVE OCULUS RIFT HEADSET

Speaking of Oculus Rift, the new Crystal Cove unit shown at CES adds positional tracking so you can lean into objects, and offers a much sharper display.

Crystal Cove Prototype
Oculus

3

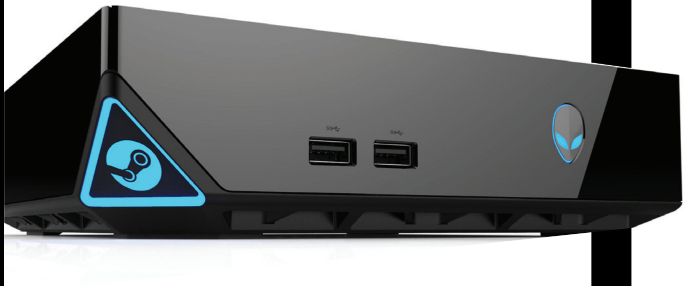
NVIDIA'S TEGRA K1 CHIP

Using the Kepler architecture and 192 CUDA cores, Nvidia's new mobile superchip will offer amazing graphics on par with the PlayStation 3, while reportedly sipping just 5W of power.

2

ALIENWARE STEAM MACHINE

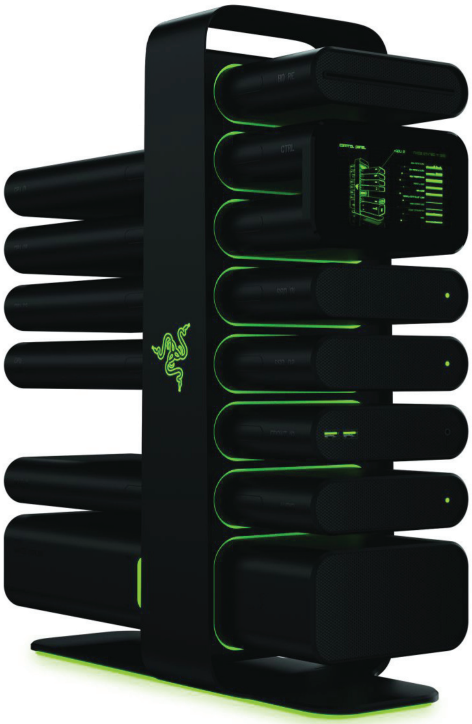
This year's show was big for the PC crowd, with the reveal of all the Steam Machines. Leading the charge was Alienware with its unique little entrant. Expect Intel/Nvidia specs.



1

RAZER PROJECT CHRISTINE

Easily the biggest surprise of the show was Razer's modular PC, dubbed Project Christine. The idea is to make changing components as easy as plugging in USB devices.

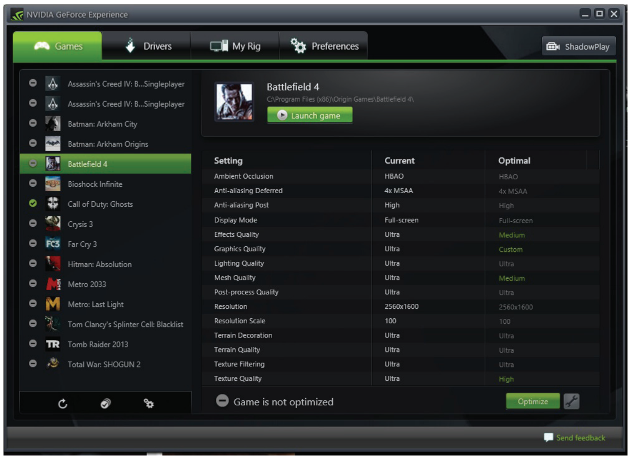


HEAD TO

BY JOSH NOREM

Nvidia GeForce Experience vs. AMD Gaming Evolved Beta

AMD and Nvidia have always fought fiercely on the hardware front, and now the battleground is expanding to include software. Both companies recently released do-it-all software clients that help you capture video, stream it, optimize your games, and lots more. And both are free. But the two packages take very different approaches, so we figured we'd pit them head-to-head to see which one is our favorite.


NVIDIA GeForce Experience
Games
Drivers
My Rig
Preferences
ShadowPlay
Assassin's Creed IV: B...Singleplayer
Assassin's Creed IV: B...Singleplayer
Batman: Arkham City
Batman: Arkham Origins
Battlefield 4
Bioshock Infinite
Call of Duty: Ghosts
Crysis 3
Far Cry 3
Hitman: Absolution
Metro 2033
Metro: Last Light
Tom Clancy's Splinter Cell: Blacklist
Tomb Raider 2013
Total War: SHOGUN 2
Launch game
Optimize
Send feedback

Battlefield 4
C:\Program Files (x86)\Origin Games\Battlefield 4\

Setting	Current	Optimal
Ambient Occlusion	HBAO	HBAO
Anti-aliasing Deferred	4x MSAA	4x MSAA
Anti-aliasing Post	High	High
Display Mode	Full-screen	Full-screen
Effects Quality	Ultra	Medium
Graphics Quality	Ultra	Custom
Lighting Quality	Ultra	Ultra
Mesh Quality	Ultra	Medium
Post-process Quality	Ultra	Ultra
Resolution	2560x1600	2560x1600
Resolution Scale	100	100
Terrain Decoration	Ultra	Ultra
Terrain Quality	Ultra	Ultra
Texture Filtering	Ultra	Ultra
Texture Quality	Ultra	High

Game is not optimized

Nvidia's software lets you adjust the optimization settings for speed or image quality, and is platform-agnostic.

ROUND 1

Game Library

The prime directive for both of these apps is to remove the mystery that surrounds game optimization, since most end users don't know what settings to select for their hardware (MSAA, HBAO, PhysX, TressFX, etc.), and the games themselves are equally incapable of determining this. Both software packages make optimizing a game as easy as clicking a button in order to use pre-determined settings. Just like with SLI and CrossFire profiles, these settings have to be created and then uploaded to the client, and both packages support only a limited number of games so far. Having a large library of supported games is the goal though, so for this category it's cut-and-dried—Nvidia so far supports 136 titles while AMD supports 69. Both companies deserve kudos for supporting titles that are bundled with its competitor's GPUs.

Winner:
GeForce Experience

ROUND 2

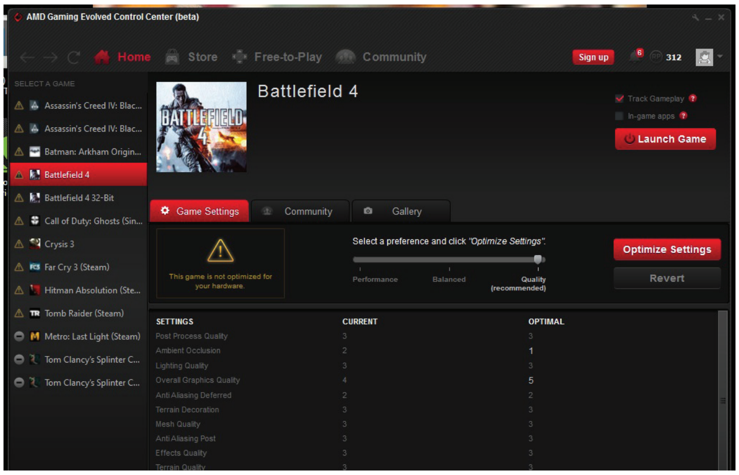
Social Features

Both software clients include features to help you share your gaming with friends and strangers, though Nvidia's offering is much more limited than AMD's. Nvidia allows for direct streaming to Twitch, and also lets you capture gameplay footage via ShadowPlay for uploading to YouTube, and both features work very well, but that's about it for GeForce Experience. AMD's Gaming Evolved, however, is an entire social network instead of just an app, as you can add friends from all the various gaming platforms, including Steam, Origin, Xbox, PlayStation, and PC. When you log into both the client and the website, you can see who is playing what, and easily broadcast to Twitch or watch other peoples' streams. The app makes it easy to share your stream on Facebook and Twitter, too, and you can access all these features without ever leaving the game.

Winner:
Gaming Evolved

HEAD

AMD uses crowdsourcing for game optimization recommendations, but also plugs you into a social network of gamers.


AMD Gaming Evolved Control Center (beta)
Home
Store
Free-to-Play
Community
Sign up
6
312
SELECT A GAME
Assassin's Creed IV: Blac...
Assassin's Creed IV: Blac...
Batman: Arkham Origin...
Battlefield 4
Battlefield 4 32-Bit
Call of Duty: Ghosts (Sin...
Crysis 3
Far Cry 3 (Steam)
Hitman Absolution (Ste...
Tomb Raider (Steam)
Metro: Last Light (Steam)
Tom Clancy's Splinter C...
Tom Clancy's Splinter C...
Battlefield 4
☑ Track Gameplay
☐ In-game apps
Launch Game
Game Settings
Community
Gallery
Performance
Balanced
Quality (recommended)
Optimize Settings
Revert

This game is not optimized for your hardware.

Select a preference and click *"Optimize Settings"*.

SETTINGS	CURRENT	OPTIMAL
Post Process Quality	3	3
Ambient Occlusion	2	1
Lighting Quality	3	3
Overall Graphics Quality	4	5
Anti Aliasing Deferred	2	2
Terrain Decoration	3	3
Mesh Quality	3	3
Anti Aliasing Post	3	3
Effects Quality	3	3
Terrain Quality	3	3

ROUND 3

Streaming

Streaming your gaming footage is the cool thing to do these days, and though both apps let you broadcast to Twitch, the Nvidia app is head-and-shoulders better than AMD's offering at this time, just because capturing or streaming your footage doesn't affect your frames-per-second like it does on the AMD app. The Nvidia ShadowPlay app lets you send the stream to Twitch or to the hard drive, and we never noticed any performance impact, as it uses the built-in H.264 encoder in the GTX 600 and GTX 700 series cards. The Gaming Evolved app, on the other hand, killed our frame rate, and the fact that there's no way to dictate the quality of the stream (which you can do with Nvidia) makes broadcasting very difficult due to a lack of control. We know AMD is working on improving this, but for now, Nvidia is the clear winner.

Winner:
GeForce Experience

ROUND 4

Optimizing Accuracy

Both of these apps take a different approach to determining the "best" settings for your hardware. AMD uses crowdsourcing and analyzes connected players' frame rate and PC configuration to see what works and what doesn't work, while Nvidia relies on its own testers to figure out the best configurations. In our testing on a high-end Ultra PC, neither utility was perfect, but overall, the Nvidia software was more accurate, telling us to leave things where they were, or turn them down just a smidgen (everything was set to max). The AMD software, however, told us to turn *everything* down in all the games we tested (Far Cry 3, Crysis 3, etc.), which is not good advice. We also like the "My Rig" section of the Nvidia software that listed our config, as the AMD software made us wonder if it even knew what kind of machine we were using.

Winner:
GeForce Experience

ROUND 5

Special Features

Though these apps are designed to optimize your games and to let you stream or save your footage, both also include several interesting features we consider to be bonus content. On the Nvidia side, the app will always keep your drivers up to date, and tells you when it last checked for an update. It will also let you stream a game to one of its Shield handheld devices. The Gaming Evolved app, on the other hand, does so many things it's overwhelming. You can chat with people on different gaming platforms, earn "reward points" that can be redeemed for games and gear, and you can also add widgets to the desktop dock, making it a fun app to use while gaming if you want to quickly chat or open a web browser. As cranky old men, we prefer the slimmed-downed Nvidia software, but there's no denying Gaming Evolved has more extra features.

Winner:
Gaming Evolved

And the Winner Is…

Both of these apps add a lot of value and new functionality to the GPU currently residing in your PC, but in this battle we prefer **Nvidia's GeForce Experience** because its core functionality works almost flawlessly. It gives better game-settings recommendations, streaming is smooth as silk, and we also love its capturing tools. AMD's app is certainly full-featured, but feels too unpolished. Of course, the AMD app is still in beta, so hopefully future versions will iron out the bugs.

DOCTOR

THIS MONTH THE DOCTOR TACKLES...

> Too Much GPU
> Wi-Fi Upgrades
> Disabling SkyDrive

From Integrated to Top-Shelf

After almost 30 years developing software on stock PCs, I finally performed my first build from the pages of *Maximum PC*. I scoured your pages from many issues and planned a build during a long weekend and it's been purring along for 18 months.

I have a Core i5-3570K on an Asus P8Z77.V board, with 16GB RAM, two 128GB SSDs, a 3TB backup drive, and 850W PSU in an NZXT Phantom 410 chassis. Now I'm thinking of adding a graphics card. I don't do a lot with graphics, so I've managed with onboard but I might do more. The GeForce 780 Ti sounds very cool. Will it work well in this system? Will overall performance improve? Apart from a Hyper 212 CPU cooler, I'm only using the Phantom's stock fans. Will I need more cooling?

—David Kates

THE DOCTOR RESPONDS: Yes, performance will certainly improve—that's one of the best graphics cards on the market, period, and it's going to be faster than your integrated graphics by a factor of four or more. But if you're not gaming or doing much graphically intensive work—and that seems to be the case—the Doc thinks the GeForce 780 Ti might be a little overkill.

There's nothing wrong with overkill, and your rig can certainly handle the 780 Ti, but if you're just getting into applications that need more graphical oomph, the Doc suggests starting with something cheaper, like the GTX 760. It's roughly a third the price of the 780 Ti but has the oomph for gaming on high settings on a 1080p panel. If you won't be gaming and just want a little more graphical muscle for everyday tasks, you'll be fine with something even less expensive.

HD Storage MIA

I recently bought a WD Green 3TB hard drive for backup purposes. I have it in a Thermaltake BlacX USB 3.0 cradle outside of the PC. I have tried a hundred different things I found online, from different partitioning hardware to updating drivers and BIOS, but I can't get the PC to recognize any more than 746GB. From what I saw online, lots of others are having the same problem. I run a Phenom II X6 1090T in an MSI 890FXA-GD65 motherboard with BIOS version 18.9, an AMD 7970, and 16GB of RAM. Any ideas would be appreciated.

—Gayle Curry

THE DOCTOR RESPONDS: It looks like the problem is with that Thermaltake BlacX cradle not correctly supporting Advanced Format drives like the WD Green series with 4KB sectors instead of 512B sectors. Depending on the model, Thermaltake lists its BlacX docks as supporting "up to 2TB" or "up to 4TB" drives, but it depends on the USB controller inside the cradle, and its firmware. It's also possible that you can update the firmware for the USB controller on your cradle, but Thermaltake's website is a little wonky—we couldn't find firmware update tools for the BlacX 5G, for example.

WD's support page indicates that you may be able to get it to work if you attach the drive directly to your motherboard's SATA ports and format it as a GPT partition in Windows Disk Management, then remove it and put it in the USB dock.

Wireless-AC Upgrade

I have a Dell Inspiron 15R-5520 with an Intel Centrino Wireless N-2230. I just purchased the Nighthawk Netgear router R7000. I would like to upgrade the wireless adapter. I contacted Dell to no avail, and can't even find an email address for Intel. Do you think that the Intel Network 7260 HMWG Wi-Fi Wireless-AC 7260 H/T Dual Band 2x2 AC + Bluetooth HMC is compatible with the Inspiron 15R? At present I can't use the 5GHz band.

—Carlos H Castillo

THE DOCTOR RESPONDS: It looks like you ought to be able to put that Intel Wireless-AC card into your Inspiron 15R. The Inspiron takes a half-height mini-PCIe wireless card, like the 7260, and the slot is user-accessible—given a generous interpretation of "user-accessible." You do have to take apart most of the laptop to get to it. Dell's service manual for your model is at http://bit.ly/1crLreZ, and we found a YouTube tutorial for your model at http://bit.ly/Kedtkr. Be sure to download the appropriate drivers from Intel's support site.

Some laptop manufacturers use a whitelist in the BIOS to restrict which wireless cards you can use with the laptop, but your particular model doesn't seem to be one of those. Your model seems to have two antennas, and the Intel 7260 has two antenna leads, so everything looks good there. Dell representatives answering other peoples' questions online seem to indicate that the 15R 5520 can accommodate adapters with 5GHz bands, too.

The standard caveat applies—neither Dell nor Intel support or recommend Wi-Fi card installation by anyone but a professional technician, and

↘ submit your questions to: doctor@maximumpc.com there's always the risk that it won't work. But if it does, well, you'll have legendary Wi-Fi speed on that Inspiron.

Mysterious Files

I am preparing to upgrade from Windows 8 Pro to Windows 8.1 Pro. While cleaning up my system and removing unnecessary files, I noticed a string of files in my C folder, with names like bdlog.txt, bdr-im or -bz, and so forth. I have attached a copy of the file names, but I have not been able to identify what program they may belong to. I was hoping you might have an answer as to how I can identify them so I don't remove something I need. As they occupy over 8GB of space it would be nice to know. So far my Internet searches have not found anything and trying various programs on my system to open them have not worked, although one file did have a note stating it could be opened with a bootloader program.

—Eli Cohen

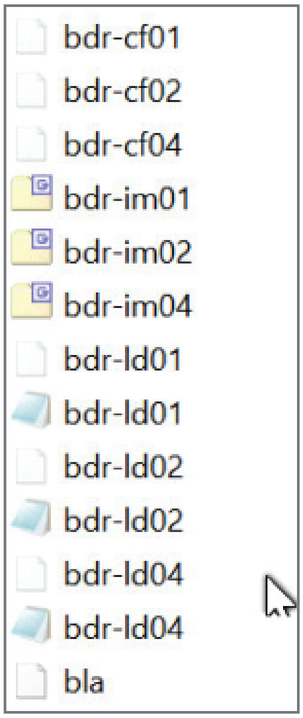
THE DOCTOR RESPONDS: Those files are normal, provided you're using BitDefender antivirus. Bdlog.txt is a normal activity log, and the various bdr-im and bdr-bz files are related to the Rescue Mode bootable Linux environment. Apparently BitDefender just dumps all this stuff into the root of the C drive rather than in a Program Files/BitDefender folder. So it's just annoying, not malicious.

GoodbyeDrive

I have been reading about the new Windows and deciding whether to make the move. I have no use for a touchscreen operating system, so it was with relief to see it is now possible to launch Windows directly into the desktop mode. However, I still have a concern. It appears that when Windows 8.1 is installed it automatically sets itself up to save files to SkyDrive by default. This gives me great concern because I do not want to use any cloud servers. Is it possible to use Windows 8.1 without using a cloud server?

—Bruce Noren

THE DOCTOR RESPONDS: Yes, you can disable SkyDrive, but it isn't obvious. Once you've installed Windows 8.1, run gpedit.msc, either by typing it into the search bar on the Start screen or by starting the Run command (Win+R) and typing it there. Go to Local Computer Policy, then Computer Configuration → Administrative Templates → Windows Components → SkyDrive. You'll see options to save documents and settings to the local PC by default, instead of SkyDrive, but it sounds like you want something more drastic. The second option is "Prevent the usage of SkyDrive for file storage." That's the one you want. Double-click it and, in the box that pops up, select Enabled. This is somewhat counterintuitive; you're not enabling SkyDrive, you're enabling the policy that disables SkyDrive. Thanks, Microsoft!



bdr-cf01
bdr-cf02
bdr-cf04
bdr-im01
bdr-im02
bdr-im04
bdr-ld01
bdr-ld01
bdr-ld02
bdr-ld02
bdr-ld04
bdr-ld04
bla

We like BitDefender, but it dumps a whole lot of files related to its Rescue Mode bootable Linux environment directly onto the root of your C drive.

AD

THE CHEAPSKATE'S GUIDE TO POWER COMPUTING

BY THE MAXIMUM PC STAFF, BEN KIM, ALEX CASTLE, AND DAVID MURPHY

HOW TO SAVE LOTS OF MONEY WITHOUT SACRIFICING QUALITY, PERFORMANCE, OR FEATURES

Our Cheapskate's Guide has become an annual installment in the magazine, because for most of us working stiffs, the ability to stretch a dollar and get more for less is *always* relevant. For some of us, it means that our love of technology and all its amazing uses won't get in the way of us paying the rent or putting new Crocs on our kids' feet. For others, saving money is more a matter of personal pride—the result of knowing the ins and outs of getting a good deal. Only suckers pay the sticker price! Whatever motivates your cheapskate tendencies, we say embrace them, and this year we offer our support in the form of tips for savvy shopping, guidance on making wise hardware purchases, pointers to killer deals in digital entertainment, and a whole lot more. Just don't spend your savings foolishly!

GET THE MOST FROM THE HARDWARE YOU OWN

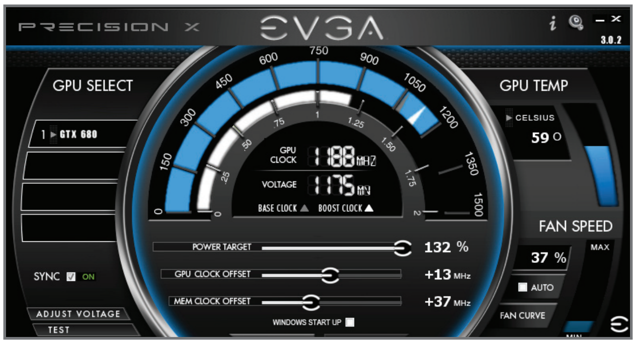
BEFORE YOU SPEND MONEY ON AN UPGRADE, MAKE SURE YOU'VE MILKED YOUR HARDWARE FOR ALL IT'S WORTH

OVERCLOCK YOUR CPU

Overclocking your CPU can be as easy as ticking a box in your BIOS, and it can open up decent performance gains that are achievable with a relatively inexpensive aftermarket cooler such as the $35 Hyper 212 Evo from Cooler Master. Most Intel boards are multiplier locked, but you can still adjust the Turbo clock and/or the base clock quite easily in the BIOS. Be careful though, as most modern CPUs will top out at just a bit above 4GHz due to cooling and voltage constraints. We've gone up to 4.2GHz or so on air and a bit higher on water, but that's the ceiling these days unless you're willing to shell out a mint for an Extreme processor from Intel or a 5GHz part from AMD, and a custom water loop to cool either. Keep in mind, however, that it's doubtful you're being held back by your CPU unless you are doing intense multithreaded video encoding.

OVERCLOCK YOUR GPU

Overclocking your GPU will provide some benefits, but keep in mind we're talking about a 5–10 percent improvement, typically, which might not be enough to overcome your particular frame-rate deficiency. In some cases you will see a 20 percent boost, but that's not guaranteed. The cheapest way to get an FPS boost is always to just buy a second GPU for CrossFire or SLI, because, though scaling isn't perfect, you should be able to see performance improve by 75–80 percent. Also, by the time you add a second card, whatever card you already own is typically much cheaper, making this the best-bang-for-your-buck upgrade you can perform.



GPU CLOCK 1188 MHZ
VOLTAGE 1175 MV
POWER TARGET 132 %
GPU CLOCK OFFSET +13 MHz
MEM CLOCK OFFSET +37 MHz
GPU TEMP 59 °
FAN SPEED 37 %

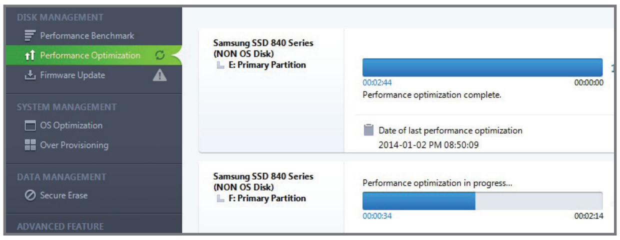
EVGA PrecisionX makes it easy to overclock your GPU, examine temps and voltages, and more.

MOVE TO AN SSD

We've said it before, and we'll say it again with no hyperbole. Moving to an SSD is one of the best PC upgrades in the history of mankind. Whereas upgrading other subsystems like RAM, CPU, and motherboard oftentimes leads to small and imperceptible performance gains, an SSD upgrade is like hitting your PC with nitrous, and its effects are immediate, system-wide, and like night-and-day compared to a spinning hard drive. Your PC will boot in half the time, programs will launch instantly, and there's no more waiting for the platters to spin up or for the drive's read heads to find your data. SSDs also emit no heat or noise, and with no moving parts they are just as awesome in a laptop as they are in a desktop. Get one today and your life will change.

TRIM YOUR EXISTING SSD OFTEN

The Trim command for Windows is sent to your SSD when it's idle, telling the drive that it's OK to permanently delete files marked as garbage, so that the next time data needs to be written to a block it can take place without the aforementioned deletion delaying the process. Imagine if every time you had to write to a block, the controller had to perform a delete operation first! Performance would suck, which is why Trim exists. But here's the problem: If your SSD holds your OS, it may rarely be in "idle" mode, and nobody knows when the Trim command actually runs. So, do your drive a favor and manually Trim it. In Windows 8 it can be done via the Tools menu (under the drive's Properties) by punching the Optimize button. Older OSes don't offer this feature, though, so you'll need a third-party tool provided by your drive manufacturer. We know that the software available for Intel and Samsung drives supports this, but we're not aware of any other free tool that lets you do it on drives of other brands.



Samsung SSD 840 Series (NON OS Disk)
E: Primary Partition
00:02:44 00:00:00
Performance optimization complete.
Date of last performance optimization
2014-01-02 PM 08:50:09

Samsung SSD 840 Series (NON OS Disk)
F: Primary Partition
Performance optimization in progress...
00:00:34 00:02:14

Some SSDs include software that lets you manually Trim your drive—a handy feature for those on older OSes.

REINSTALL WINDOWS

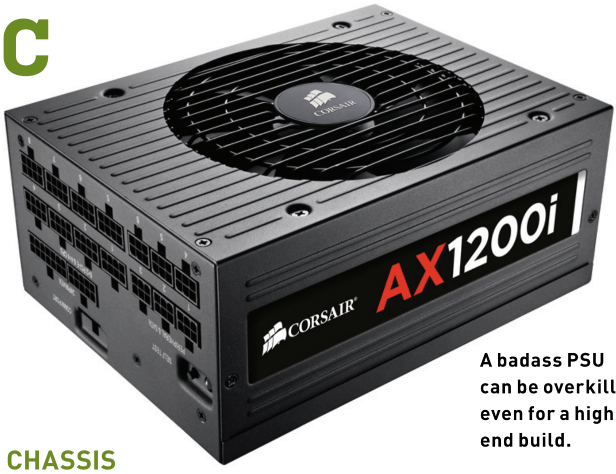
Nothing runs faster, not even a Kenyan, than a fresh install of Windows. It's true that the arrival of SSDs has negated this effect somewhat, but in our experience, a squeaky-clean install is noticeably perkier than a thrashed and litter-strewn 2-year-old installation. We know most of you pride yourselves on your years of uptime, but there comes a time when too many weird and unexplainable phenomena (updates not working, general slowness, etc.) will require you to throw up your hands and start over. It's nothing to be ashamed of, and your new OS's snappy performance will make you feel better in the end.

ADD RAM—TO A POINT

If you're using less than 8GB of RAM there's a very real chance your system is using almost all of it from time to time, if you're like us: a gnarly multitasker. Your OS will take a few gigs right off the bat, and browser tabs can eat another gig; open Photoshop and it's all over but the crying. We don't say this often, but if you only have 4GB of RAM, double it pronto. If you have some leftover Christmas money, treat yourself to 16GB just to be safe.

MAKE REALISTIC PURCHASES

DON'T BUY MORE PERFORMANCE THAN YOU NEED



A badass PSU can be overkill, even for a high-end build.

We'll admit we're guilty of pushing a *Maximum PC* worldview, but we also advocate upgrades that will actually make a difference in your day-to-day computing rather than just looking good in a forum signature. Here are the most often abused upgrade paths—be sure to steer clear of them.

PSU

You can run dual GTX 680s and nine hard drives off a 600W PSU, and we know because we've done it. When buying a PSU, use an online calculator to tabulate how much power your system will actually need instead of just buying an 850-or-higher wattage PSU. That said, don't buy a no-name unit. Quality and reputation are important here.

MULTI-CORE AND/OR HYPER-THREADED CPU

Everyone loves the idea of an eight- or 12-core CPU, but the reality is, unless you're rendering 3D models or doing hardcore video work, most of the applications you use will never touch those extra cores, so don't waste your money on them. The same goes for Hyper-Threading, which is virtual CPU cores—most apps don't even know they exist. In our testing, gaming performance actually dropped with Hyper-Threading enabled, and the only apps that improved by adding cores were Adobe Premiere, HandBrake, and other apps of that nature.

CHASSIS

A full-tower looks good IRL and in a forum signature, but can be a massive waste of money and space unless you're water-cooling. Otherwise you get a whole lot of real estate that goes unused. If that's your bag, we get it; we like a roomy interior, too. But these cases cost more than twice what a generous mid-tower will set you back, and we'd prefer to put that cash into a GPU or SSD.

RAM

Most home users will get by just fine with 8GB, and extreme photo and video editors might need 16GB or 32GB in really extreme situations. Among the *Maximum PC* staffers, 8GB or 16GB is the norm, and we have never had a need for more than that. Even amateur photographers and videographers will be fine with 16GB. Overclocked RAM is only beneficial in certain applications and can help with CPU overclocking, but for average use and a regular diet of gaming, stick with DDR3/1600 and you'll be just fine.

PROCEED WITH CAUTION

YOUR NAME IS MARK AND THE STORE KNOWS IT

Most wireless companies' "kit" chargers are generic junk.

When you buy a new device your emotions run high and your ability to think straight is impaired. That's when the vultures strike. But our advice is to just say no to these shiny extras.

THE NEW PHONE KIT BUNDLE

These kits typically include a generic, low-output car charger, generic screen protector, mediocre headset, and a screen protector. The only thing we'd really even consider buying at the store with a new phone purchase is the case. That's because new phones, tablets, and other mobile items are scientifically proven to be subject to additional gravitational pull the first month you own them (in other words, you're sure to drop it the day before your case arrives from Amazon).

THE FANCY CABLE

You need the braided HDMI cables with your HDTV, receiver, or what not, right? No, you don't. The braids do look beautiful, but nine out of 10 times, it's just a way to charge you $35 for a cable that would otherwise be $10 or less. Shoot, some big box stores probably make more money on store-branded cables than they do on their other merchandise. As much as we all wish the braided Super Cable did something special, it doesn't.

THE EXTENDED WARRANTY

Most folks know this, but it doesn't hurt to repeat it: Extended warranties are like gambling and the house always wins. Those extended warranties are pure gravy to the store, which knows that your hardware is 97 percent unlikely to ever fail within the warranty period. That's why the stores all push them. For most of us, it's better to just roll the dice.

SMART SHOPPING STRATEGIES

SAVING YOUR PENNIES WHEN PURCHASING ONLINE IS EASIER THAN YOU MIGHT THINK

A little bit of time and effort can save you a not-so-insignificant amount of cash when you're shopping online. Trust us. The last time we went shopping for pants, for example, a quick online scan for promo codes helped us to double-stack savings—turning a measly 20 percent discount into a much more pleasing 65 percent discount (and allowing us to buy two pairs instead of one!). We're not talking rocket science here, just perseverance. And of course, it pays to know all the most effective techniques.

BOOKMARK THE BEST DEAL SITES

The web is full of "deal sites"—as in, giant listings of items that have either been found by the site itself or posted by its visitors. These items are typically discounted from their regular retail price any number of different ways, from standard sales that sleuths have stumbled across, to creative uses of promotional codes and other offers, to the leaking of special URLs reserved for a vendor's "elite" shoppers.

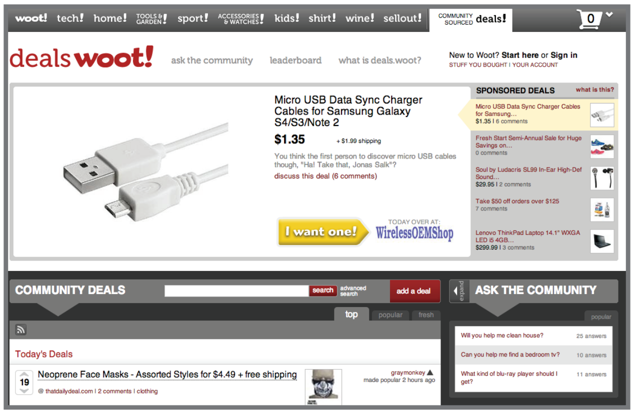
So, which are some of the best resources?

SlickDeals The alpha and omega of deal sites, this super-popular site is a great, general resource for deals spanning all kinds of categories. You can even have the site email you when new deals pop up for certain products you're interested in. www.slickdeals.net

CheapAssGamer If you want to narrow your search to video games, then CAG (as it's affectionately known) is where you'll find great gaming deals *and* a vibrant community. www.cheapassgamer.com

Reddit Yes, there are Reddits for everything, it seems. Hit up /r/deals, /r/dealsreddit, and /r/gamedeals for your general and gaming-related purchases; /r/coupons if you're keen on promos; and /r/freebies for, well, just that. And of course, don't forget /r/buildapcsales. www.reddit.com

DealNews Second verse, same as the first. This site, like SlickDeals, dishes out a whole ton of bargains across an equally large number of categories. There's no forum, just straight-up savings. www.dealnews.com


woot! tech! home! TOOLS & GARDEN! sport! ACCESSORIES & WATCHES! kids! shirt! wine! sellout! COMMUNITY SOURCED deals!
0
deals woot!
ask the community
leaderboard
what is deals.woot?
New to Woot? Start here or Sign in
STUFF YOU BOUGHT I YOUR ACCOUNT
SPONSORED DEALS
what is this?
I want one!
TODAY OVER AT:
WirelessOEMShop
COMMUNITY DEALS
search
advanced search
add a deal
expand
ASK THE COMMUNITY
top
popular
fresh
popular
Today's Deals

Micro USB Data Sync Charger Cables for Samsung Galaxy S4/S3/Note 2
$1.35 + $1.99 shipping
You think the first person to discover micro USB cables though, "Ha! Take that, Jonas Salk"?
discuss this deal (6 comments)

Micro USB Data Sync Charger Cables for Samsung... $1.35 I 6 comments
Fresh Start Semi-Annual Sale for Huge Savings on... 0 comments
Soul by Ludacris SL99 In-Ear High-Def Sound... $29.95 I 2 comments
Take $50 off orders over $125 7 comments
Lenovo ThinkPad Laptop 14.1" WXGA LED i5 4GB... $299.99 I 3 comments

19 Neoprene Face Masks - Assorted Styles for $4.49 + free shipping
@ thatdailydeal.com I 2 comments I clothing
graymonkey made popular 2 hours ago

Will you help me clean house? 25 answers
Can you help me find a bedroom tv? 10 answers
What kind of blu-ray player should I get? 11 answers

The site Deals.woot.com is another great example of a community-driven deal aggregator; we tend to like sites that have a bit of a competitive element, as it usually leads to better deals!

T PROMO CODES IN YOUR INBOX!
LUSIVE SAVINGS FOR SUBSCRIBERS
Enter your e-mail
SIGN UP!
PUTER HARDWARE
PCS & LAPTOPS
ELECTRONICS
CAMERAS
SOFTWARE
GAMING
CELL PHONES
HOME & OUTDOORS
AUTOMOTIVE
OUTLET
MARKETPLACE
MORE
FIND YOUR NEW YEAR
UPGRADES
CORE COMPONENTS
PERIPHERALS & MORE

Signing up for e-newsletters might not seem like a hot tip, but Newegg's often delivers promos and prices you simply won't find listed elsewhere.

FatWallet While we're a bit more keen on SlickDeals's listings, we find the FatWallet forums to be irresistible. Promo codes, coupon codes, and helpful advice—especially for travel and finance—make this site's giant community worth checking out. The bonus cashback you can get for listed deals is the icing on the cake. www.fatwallet.com

LEVERAGE COUPON CODES

Our first stop when shopping is a handy little site called RetailMeNot (www.retailmenot.com), a great place to quickly find active promo codes for a variety of online shopping sites. If that doesn't turn up results, we look to other sites like Coupon Predator (www.couponpredator.com), Google, and even a Twitter search to see what's out there. That might sound primitive, but it works.

Beyond that, browser extensions like Honey or Coupons at Checkout will automatically search for promo codes when you go to make a purchase. Unfortunately, they might also pull in coupons for larger retail sites that have absolutely nothing to do with what you're buying (a bit of a tease).

And don't forget newsletters! Newegg is a great example of a site that'll often stuff interesting deals into the emails it blasts your way, as is TigerDirect (and Mwave, Directron, etc.). All of the various Groupon-like sites—LivingSocial, Amazon Local, Travelzoo, to name a few—are also worth checking out for deals in categories beyond electronics.

No matter what you sign up for, however, we recommend that you fire up a Gmail account and use the ol' trick of adding a plus symbol and extra characters to your email address for newsletter purposes (so, Tom+deals@maximumpc.com instead of Tom@maximumpc.com). Your email will still route to the same location, but you'll have a much stronger ability to filter the bounty of messages you'll receive.

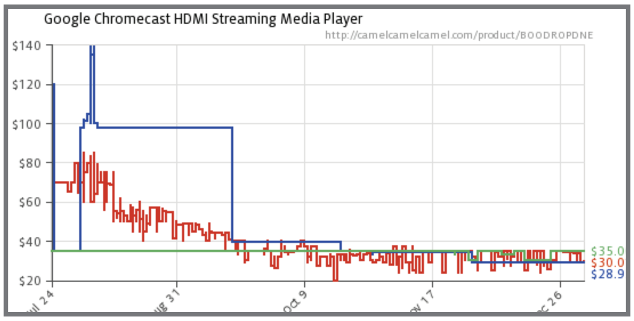
BROWSER PLUGINS FOR BARGAIN SHOPPING

It's always great when your web browser itself can do your deal hunting. Of course, you're going to have to install an extension or two to transform Chrome or Firefox into a shopping machine.

One of our favorites is (oddly) called Camelcamelcamel; it ties into the website of the same name, and tracks the prices of things you're looking to purchase on Amazon or Bestbuy.com. (It used to work on Newegg as well, but doesn't as of this article's writing). The extensions Priceblink and Invisible Hand are also worth having in your back pocket, as they'll automatically notify you if they can find a lower price for items you're looking at on a particular retailer's website.

If you're a huge Amazon fan, you can grab the company's "Add to Wish List" extension. When you're shopping anywhere else, simply click the little button in your browser to automatically add whatever you're looking at to your Amazon Wish List (presumably, to purchase later with your fancy Amazon Prime account).

While it's not a browser extension, we just have to mention the web app Slice—sign up for the free service, and you'll be able to get notifications on your smartphone when your packages have shipped and when they're delivered!



Camelcamelcamel does a great job of providing a bit of historical context for official and third-party Amazon prices.

PRICE MATCHING

It's no secret that you can often score much better deals with a bit of online sleuthing than you can in a brick-and-mortar store. What if you want your brand-new video game today, however, instead of having to wait for it to ship out from some random online retailer?

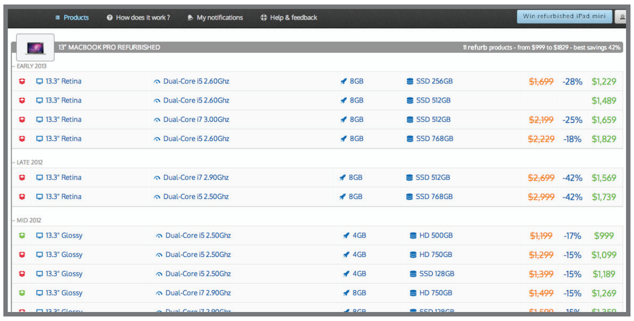
Here's the catch: While a number of retail chains like Staples, Best Buy, Target, and Wal-Mart (to name a few) will price-match against online entities like Amazon, their policies can all differ regarding specifics. Best Buy, for example, limits the number of sites it'll consider for price matching, and any items that are subject to "deal of the day" specials (or the like) don't apply—thus rendering price matching a bit moot.

Timing varies with the brick-and-mortar stores, as well. Best Buy, for example, needs to know the lower price you're trying to match when you go to purchase an item. Target, however, gives you a seven-day window from the point of purchase to find a lower price from a slim list of online retailers.

Our advice? Stick to the deal sites we've previously listed; trying to play the price-matching game is more trouble than it's worth.

THE AMAZON TAX HACK

A good online deal can be soured when you're reminded that you have to pay sales tax at the checkout page. There's a way around this on Amazon, however. For eligible items, if you buy through third-party vendors that have their orders "Fulfilled by Amazon" then you can skirt around Uncle Sam. These items will actually be shipped from Amazon's warehouse and are also eligible for free two-day shipping under Amazon Prime. Of course, do make a mental note to yourself to pay these back taxes at the end of the year, OK?



13" MACBOOK PRO REFURBISHED — 11 refurb products - from $999 to $1829 - best savings 42%

EARLY 2013						
13.3" Retina	Dual-Core i5 2.60Ghz	8GB	SSD 256GB	~~$1,699~~	-28%	$1,229
13.3" Retina	Dual-Core i5 2.60Ghz	8GB	SSD 512GB			$1,489
13.3" Retina	Dual-Core i7 3.00Ghz	8GB	SSD 512GB	~~$2,199~~	-25%	$1,659
13.3" Retina	Dual-Core i5 2.60Ghz	8GB	SSD 768GB	~~$2,229~~	-18%	$1,829
LATE 2012						
13.3" Retina	Dual-Core i7 2.90Ghz	8GB	SSD 512GB	~~$2,699~~	-42%	$1,569
13.3" Retina	Dual-Core i5 2.50Ghz	8GB	SSD 768GB	~~$2,999~~	-42%	$1,739
MID 2012						
13.3" Glossy	Dual-Core i5 2.50Ghz	4GB	HD 500GB	~~$1,199~~	-17%	$999
13.3" Glossy	Dual-Core i5 2.50Ghz	4GB	HD 750GB	~~$1,299~~	-15%	$1,099
13.3" Glossy	Dual-Core i5 2.50Ghz	4GB	SSD 128GB	~~$1,399~~	-15%	$1,189
13.3" Glossy	Dual-Core i7 2.90Ghz	8GB	HD 750GB	~~$1,499~~	-15%	$1,269

RefurbMe is a handy site for finding refurbished Apple products for cheap. The tracking element is especially useful, given how products arrive and disappear from Apple's refurb site.

THE REFURBISHED OPTION

One great way to save cash on your major PC purchases is to go refurb; specifically, items that the manufacturer has received and fixed up (or has decided are eligible for a discounted sale). Perhaps the exterior of the laptop is a wee bit scuffed—you might decide you can live with that for a $300 discount.

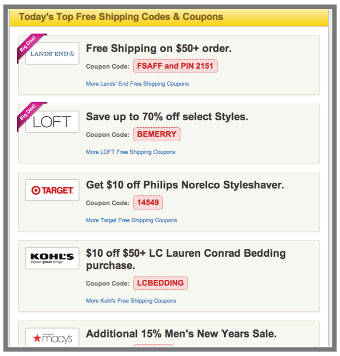
Hate all you want, but Apple does a great job of testing and fixing its refurbished goods, even going so far as to offer a one-year limited warranty and full return support as if the item were purchased brand-new. Dell and HP also offer pretty strong warranty and return policies, as does Newegg, but you'll definitely want to check that whichever store you're looking to buy refurb from gives you a plethora of return options, to be safe. Amazon, for example, might offer a ton of options for buying used, but you might be bound by the stricter return policy of an individual seller. Caveat emptor.

We didn't find any strong, comprehensive sites that track refurb sales across a number of different manufacturers and retailers, other than the Apple-centric RefurbMe (www.refurb.me).

SHIPPING SERVICES

If you're a junkie for a particular retail site—Amazon or Newegg spring to mind—then it might be worth your while to sign up for that site's shipping service, should it offer one. Amazon Prime gives you "free" two-day shipping for an annual fee; Newegg uses Shoprunner (also $79 a year), which is a similar service that covers a large number of participating stores simultaneously.

If you don't want to pay the annual fee, but still want to take advantage of the services for a particular large purchase or shopping spree, you can always sign up for each site's 30-day trial (so long as you remember to cancel it before the month is up!) Or you can always check out FreeShipping.org to see if you can get your purchases sent gratis via a code or deal.



Today's Top Free Shipping Codes & Coupons

Free Shipping on $50+ order.
Coupon Code: FSAFF and PIN 2151
More Lands' End Free Shipping Coupons

Save up to 70% off select Styles.
Coupon Code: BEMERRY
More LOFT Free Shipping Coupons

Get $10 off Philips Norelco Styleshaver.
Coupon Code: 14549
More Target Free Shipping Coupons

$10 off $50+ LC Lauren Conrad Bedding purchase.
Coupon Code: LCBEDDING
More Kohl's Free Shipping Coupons

Additional 15% Men's New Years Sale.

FreeShipping.org is one-half shipping codes, one-half deals, but definitely worth a stop if you just can't figure out a way to avoid expensive shipping charges.

BEST PRACTICES FOR BUYING USED GEAR

OR HOW NOT TO GET BURNED

BUYING A USED PHONE

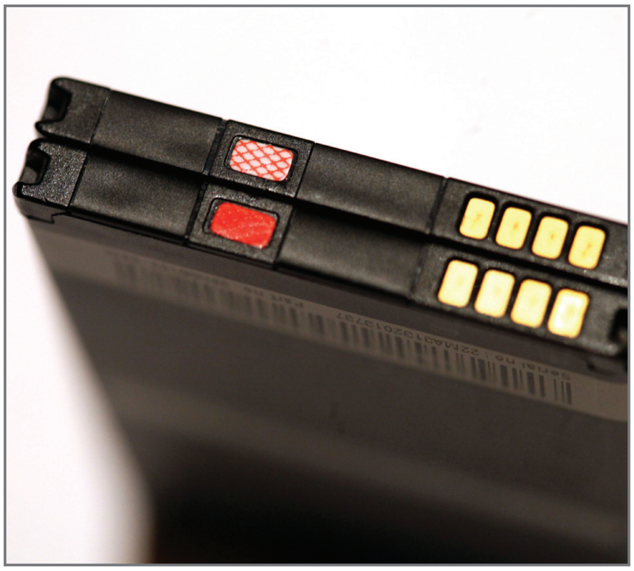
Buying a used smartphone is an easy way to save hundreds of dollars. The two big places to buy phones and tablets today are eBay and Craigslist. eBay is problematic for picky buyers, as you can't touch before purchasing. You instead have to rely on the descriptions. If we had to buy a phone on eBay and wanted to improve our chances of being satisfied, we'd stick with vendors who sell dozens or hundreds of phones. These vendors are more concerned with maintaining a reputation, so if you have problems with a phone, returning it shouldn't be a problem. As always though, read the fine print on returns and refunds before you make a bid.

If you prefer the face-to-face interaction of Craigslist, there are a few tips you should follow. First, for security's sake, meet in a public place such as a café and never go to a second location with the seller because they "forgot the charger." (Right, follow them outside with $400 cash in your pocket!). If you're really leery, ask them to meet you in the lobby of a nearby police station. This applies to any face-to-face transaction, of course.

Kick the tires first! On any phone, the common failure points are headphone jack and charger port. Bring your own ear buds, plug them in, and put light pressure on the cord where it plugs in while playing audio to see if it cuts out. If it does, the port may be damaged. Likewise, plug the phone into the wall and see if the phone will show that it's charging while putting light pressure on the cord from different angles. If it loses connection at a certain angle, the charging port may be damaged.

Check the phone's moisture indicators—usually on the battery or inside the phone or hidden inside the headphone jack or card slot. You may need a magnifying glass and flashlight. Most turn dark red or purple after they've been exposed to moisture.

Also function-check all of the phone's physical buttons and switches to make sure they engage *and* disengage, and check that there are no issues with the touchscreen's digitizer by testing the corners in particular, since they're prone to stress. Check the phone's electronic serial number, or ESN, and make sure it's not on your carrier's blocked list. Carefully examine the chassis and screen alignment too, as well as the screws that hold the phone together. If the parts seem out of alignment, or the tamper seal is simply gone, there's a good chance the "new" phone has been opened up.



These are identical batteries but the one with the red moisture indicator has gone through the washer.

Some vendors only care if a product is within a warranty period, not who bought it.

These same rules apply to tablets. The only other test we'd do with a tablet is to try to twist the tablet by the corners very gently. This should exert pressure on the panel and digitizer, and could reveal whether there's a loose connection from being dropped one time too many. We'd also be a bit more careful about checking the tablet's screen, so pull up a paint program and view pages of different solid colors to look for dead pixels.

BUYING PC PARTS

Buying used PC parts can be a bit trickier. If you're buying a used GeForce Titan for $500, you certainly can't test it in Starbucks. The good news is that most PC parts tend to be pretty resilient. Dead CPUs and GPUs are rare. Some PC parts vendors are very good about honoring warranties regardless of who originally bought the parts, but you'll want to verify this beforehand. Hard-drive vendors, for example, typically don't care who bought the drive, as warranties typically start from date of manufacture.

Frankly, buying PC parts face-to-face, where you can't power them up and test them is almost sketchier than buying from a person on eBay, where the seller is likely to want to protect their reputation, or in a worse-case scenario, eBay itself can intercede in a purchasing dispute.

STREAM EVERYTHING: MOVIES, MUSIC, TV, AND MORE

CUTTING THE CABLE HAS NEVER BEEN EASIER

Is there anything worse than paying big bucks for a monthly cable subscription and an assortment of Blu-rays? If you have a high-speed Internet connection, you don't need to anymore. There's never been a better time to consider cutting the cable, with streaming websites galore and services available for pretty much everything.

MOVIES

It's a great time to be a movie lover. Between Netflix, Amazon Instant Video, Crackle, and Hulu, there are loads of options to choose from. Netflix is still the frontrunner, with its $7.99-per-month streaming plan, huge library with 720p and 1080p "Super HD" video, 5.1 surround sound, and support for nearly every modern device—Roku, Chromecast, mobile phones, and more. Compare that to Amazon Prime Instant Video, which gives Amazon Prime members access to a library of some 40,000 movies and TV episodes as well as some à la carte offerings.

TV

If you need the latest TV episodes, Hulu's your best bet. Recent episodes from most networks are available for free on your PC and upgrading to the $7.99/month Hulu Plus subscription gives you HD streams, expanded device support, and access to Hulu's backlog.

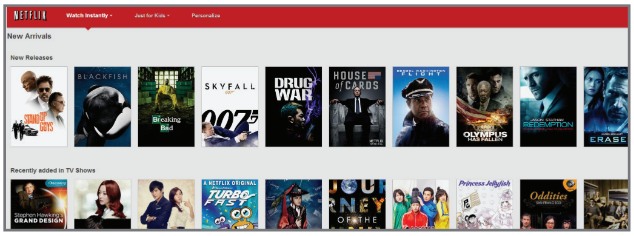
Netflix and Amazon Instant Video both also include a pretty large selection of TV shows. Recent episodes aren't always available, but it's hard to beat paying $7.99 a month for both TV and movies.

MUSIC

Our top pick is still Spotify. With its massive library of ad-supported music, it's the best option for on-demand music streaming. Pay $4.99/month and all the ads are stripped away. Pay $9.99/month and you get mobile access with offline listening and "Extreme" audio quality (320Kb/s).

Live radio and jukebox fans will love iHeartRadio. It's a service that gives you access to more than 1,500 live radio stations across the country. It also lets you create customized radio stations that pull from iHeartRadio's music library of over 15 million songs. iTunes Radio is a newer alternative, but the lack of Android support is pretty unforgivable.

Looking to actually purchase songs? Check the prices on Amazon MP3—chances are good that they're cheaper than iTunes if not the exact same price (but unencumbered by DRM). If music exploration's your thing, both NoiseTrade (www.noisetrade.com) and the Free Music Archive (www.freemusicarchive.org) offer free songs from smaller artists.



Netflix remains the force to be reckoned with when it comes to streaming commercial content.

BOOKS

If you don't want to make regular trips to your local library, there are some cheapskate alternatives. Most public libraries offer online checkout of e-books and audio books. How it works largely depends on your local library, but it's a great option if you're looking for recent books. If you don't have a problem reading classics, Project Gutenberg (www.gutenberg.org) has been around for a long time, collecting public domain books and making them available for free. There's also the Kindle Owners' Lending Library, which gives Amazon Prime subscribers the chance to borrow one e-book per month from a growing selection of books.

SPORTS

Anyone who's ever tried to cut the cord knows that sports has always been the sticking point. Unfortunately, not much has changed, and the easiest way to get your sports fix is to stick with cable or hook up a TV tuner for local broadcasts.

If you're not a regular ESPN or ESPN 2 watcher, you might be able to get by with paid subscriptions to the leagues that you care about most. All of the major sports leagues offer some sort of subscription—with prices as high as $200. The passes usually last for the entire season, but are sometimes gimped by restrictions that might make local games or even playoff games unavailable.

CHROMECAST: THE POOR MAN'S SMART TV

The Chromecast is Google's $35 Roku and Apple TV competitor. Plug the 3-inch device into an HDMI port on your TV—plus a USB port for power—and you can stream content from Chromecast-enabled apps on your PC, phone, or tablet, and through Chrome itself. Since it launched in July, Google's been pushing for further Chromecast development. Some of that has finally paid off with more than a few services now touting official support. Hulu, Pandora, HBO Go, Plex, and more have joined Netflix and Google Play with compatible apps. It's still got a ways to go before it can really compete with the ease-of-use and accessibility of either the Roku or the Apple TV, but at only $35 it's hard to argue with super-simple streaming.

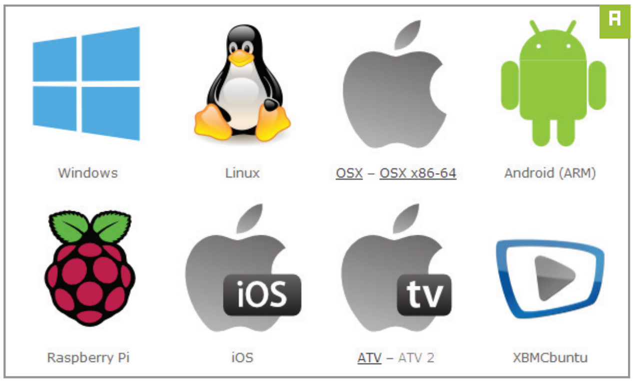
Since the Chromecast can only be used as a secondary device, it's safe to say that it's not a real threat to dedicated digital media receivers. Having to reach for your phone or laptop to peruse your Netflix queue isn't nearly as convenient as pressing play on a Roku remote. Google's continued focus on Chromecast is a good sign and the future of the Chromecast isn't as bleak as it once was.

GETTING XBMC UP AND RUNNING

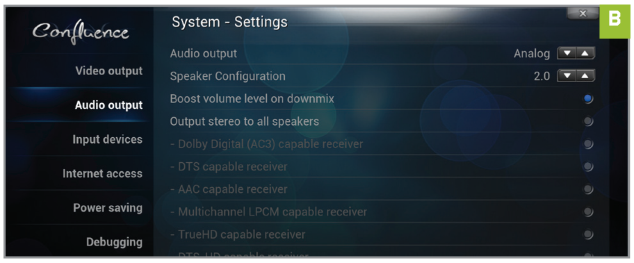
OPEN-SOURCE MEDIA-CENTER GOODNESS FOR FREE

If you're looking for a front end for your media center, look no further than XBMC. It's completely free, installing it is a cinch, and a massive library of user-created add-ons means that plenty of your favorite services are probably supported.

1 **DOWNLOAD AND INSTALL XBMC** Download XBMC (www.xbmc.org) for the operating system you're running (**image A**) and install it. You've also got the option of installing XBMCbuntu—a stand-alone OS running on Linux.


A
Windows
Linux
OSX – OSX x86-64
Android (ARM)
Raspberry Pi
iOS
iOS
tv
ATV – ATV 2
XBMCbuntu

2 **UPDATE YOUR AUDIO AND VIDEO SETTINGS** Chances are good that XBMC will pick the right resolution for your setup, but make sure by going to System > Settings > Video output and checking the Resolution option. While you're in the settings menu, check the Audio output tab to fine-tune your audio settings (**image B**).


B
Confluence
Video output
Audio output
Input devices
Internet access
Power saving
Debugging

System - Settings

Audio output Analog

Speaker Configuration 2.0

Boost volume level on downmix ●

Output stereo to all speakers ○

- Dolby Digital (AC3) capable receiver ○

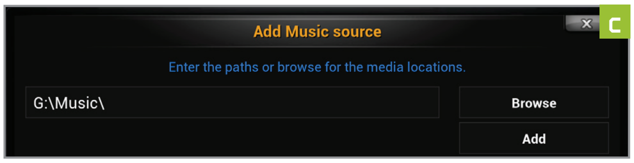
- DTS capable receiver ○

- AAC capable receiver ○

- Multichannel LPCM capable receiver ○

- TrueHD capable receiver ○

3 **IMPORT YOUR LOCAL CONTENT** A media center is pretty worthless without any media. Fortunately, importing content into XBMC is ridiculously easy. Select the Video or Music tab and click Add Source. Browse to where you keep your content, click the folder, and give it a name (**image C**).


C

Add Music source

Enter the paths or browse for the media locations.

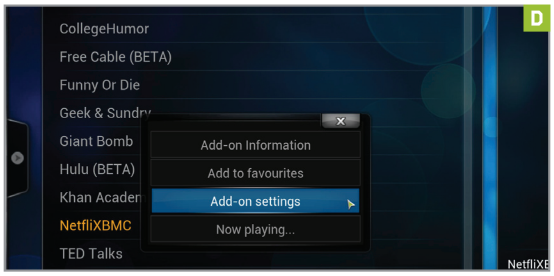
G:\Music\

4 **INSTALL ADD-ONS** Add-ons are the lifeblood of XBMC. Most of them are easy installs—go to System > Settings > Add-ons > Get Add-ons > All Add-ons and select from any of the available categories to search through the official XBMC repository. Pick an add-on and click Install.

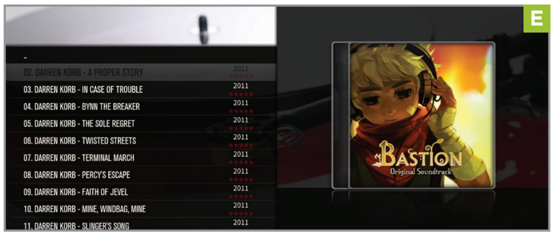
Some beta add-ons aren't available without a bit of tinkering. We recommend NetfliXBMC, Spotimc, and the unofficial Hulu add-on to start with.

Installing NetfliXBMC is a bit of a chore. First, download AddOnScripterDE's repository (http://bit.ly/NetfliXBMC). Then go to Settings > Add-ons > Install from zip file and select the zip file you downloaded. Now when you click Get Add-ons, you should see AddOnScripterDE's Beta Repo as an option. Select it, head into Video Add-ons, and install NetfliXBMC. Once it's installed, right-click NetfliXBMC, go to Add-on settings (**image D**), and enter in your Netflix account information. While you're in the settings menu, click the Advanced tab and select IExplorer under Win Browser. If you've done everything right, you should be able to access Netflix and watch videos.

The process is a bit simpler for BlueCop's Hulu add-on and Spotimc. To get access to Hulu, download BlueCop's repository (http://bit.ly/HuluXBMC) and install it by selecting the repo. Spotimc (http://bit.ly/Spotimc), the unofficial Spotify add-on, is even easier to install. All you have to do is download and directly install the zip file.


D
CollegeHumor
Free Cable (BETA)
Funny Or Die
Geek & Sundry
Giant Bomb
Hulu (BETA)
Khan Academ
NetfliXBMC
TED Talks
Add-on Information
Add to favourites
Add-on settings
Now playing...
NetfliXB

5 **MAKE IT LOOK NICE** XBMC looks fine the first time you start it up, but there's more than a few alternate skins available. Go to System > Settings > Appearance > Skin > Get More to get access to them. We recommend Aeon Nox, Aeon MQ 5 (**image E**), and re-Touched if you're running XBMC on a device with a touchscreen.


E

..

02. DARREN KORB - A PROPER STORY 2011

03. DARREN KORB - IN CASE OF TROUBLE 2011

04. DARREN KORB - BYNN THE BREAKER 2011

05. DARREN KORB - THE SOLE REGRET 2011

06. DARREN KORB - TWISTED STREETS 2011

07. DARREN KORB - TERMINAL MARCH 2011

08. DARREN KORB - PERCY'S ESCAPE 2011

09. DARREN KORB - FAITH OF JEVEL 2011

10. DARREN KORB - MINE, WINDBAG, MINE 2011

11. DARREN KORB - SLINGER'S SONG 2011

BASTION
Original Soundtrack

HOW TO SAVE ON SOFTWARE

GET CHEAP OR FREE SOFTWARE WITHOUT LOSING OUT

ANTIVIRUS

Computer security is not an area where you want to cut corners, but these days you can get all of your antivirus needs covered without spending much at all. For many users, the days of shelling out big bucks for a yearly subscription AV suite are over—Microsoft provides formidable built-in protection in the form of Windows Defender, a powerful free antivirus program included in Windows 8.

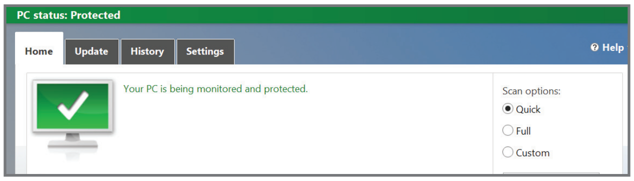
If you'd like even more full-featured AV, or you want to stick with the antivirus suite you already know, the best way to save money is to buy through a reseller. A simple Amazon search for Kaspersky or Norton returns dozens of reputable sellers offering the latest versions of these suites for 50 percent off retail price.

IMAGE EDITOR

Even if you don't consider photography a hobby, you should know a little bit about photo editing. A quick pass through the right software can take even the most amateurish photos and give them a little extra pop. There's plenty of ways to do this without spending money, depending on your needs.

If you just want to occasionally spruce up pictures with features like contrast and color adjustment, red-eye reduction, and cropping, you may not need to download anything at all. Popular photo organization tools Flickr (www.flickr.com) and Picasa (http://picasa.google.com) both come with built-in tools that let you do all that for free.

For cheapskates that want the power of a full photo-editing suite for free, the answer is (as always) Gimp (www.gimp.org). The formidable open-source editor can do almost everything Photoshop can, including automatic image adjustments, batch processing, and manual photo correction (see our Gimp how-to on page 64). Finally, consider that Photoshop itself isn't as expensive as it once was. Photoshop Elements (www.adobe.com) offers all the photo correction options a non-expert photographer needs with a very user-friendly interface for $60. Alternatively, Adobe's new subscription options allow you to "rent" Photoshop by the month for $30.



PC status: Protected

Your PC is being monitored and protected.

Scan options:
● Quick
○ Full
○ Custom

Windows Defender: The best thing to happen to security-minded cheapskates.

OFFICE APPS

Microsoft Office has a death grip on the commercial office apps market on Windows, but there are plenty of alternatives if you look around. If you're able, the best solution for most folks is to simply move your documents cloud-side, with Google Apps (https://drive.google.com). The browser-based word processor, spreadsheet, and presentation software are all powerful and user-friendly, and you can access your files from any computer or smartphone.

If you prefer a more traditional software suite, the open-source alternative is Libre Office (www.libreoffice.org), a descendant of the popular Open Office. It's a big download, but Libre Office has all the features of Microsoft Office, and can open and save files with the widely used Office file extensions.

OPERATING SYSTEM

When it's time to really make the switch to free software, you've got to start from the ground up—you've got to switch to a free operating system. The subject of making the switch to Linux is too broad to fit into a paragraph or two, but we'll tell you how to get started. We recommend Mint, a very beginner-friendly Linux distro that's based on Ubuntu. Ubuntu (www.ubuntu.com) is also a great choice, but the Mint GUI will be slightly more intuitive for people used to Windows. Head to www.linuxmint.com to download the latest version of the OS, and then click over to the Documentation tab. The guide is pretty long, but doesn't involve anything that will be difficult for a moderately experienced computer user.

VIDEO ENCODING/PLAYBACK

When it comes to playing video content, the best free option is also the best option, period. Download VLC (www.videolan.org), a free media player that offers playback for just about any file type or codec under the sun. If you want to go a step further and transcode videos from one format to another, the software you're looking for is HandBrake (http://handbrake.fr), a free utility that makes it easy to create video files perfectly suited for any device.

STUDENT, GOVERNMENT, AND COMPANY DISCOUNTS

One thing to keep in mind when hunting for cheap software is that you might be able to get deeper discounts through your employer or school. If you work for the government or military, for instance, you could be eligible for a program that allows you to download Microsoft Office for just $10. If you work for a big company, you might be able to get bulk-priced software for home use, as well. We can't say what any particular employer offers, of course, so your best bet is to get in contact with your IT department, and ask if they offer any discount programs for at-home use.

What's the one group that companies love the most? Students. College students and kids are broke now, but could someday be valuable customers, so companies like Microsoft, Dell, and Apple try to earn their favor with discounts on just about everything. All versions of Windows and Office are 10 percent off for students, for instance, and Adobe offers a huge 40 percent educational discount on its pricey software. Hardware is also cheaper if you have an educational email address, with Apple and Dell offering substantial savings on laptops for students. The main takeaway here is that if you're a student, never buy anything online without first searching to see if a discount is available.

Note that most educational discounts are also available to school faculty, so if you or someone in your family is a teacher you can cash in on these deals. Finally, college students should remember that universities are big organizations, too, and may have their own bulk-rate deals on software. Talk to your campus technology department for more info.

BEST BANG-FOR-THE-BUCK GAMES

THESE DEALS ARE SO GOOD IT'S ALMOST A CRIME TO PASS THEM UP

COUNTER-STRIKE: GLOBAL OFFENSIVE

CS:GO takes the challenge and balance of the original game and gives it a big face-lift and the most accessibility the franchise has ever seen. You can play it at a variety of skill levels and still have fun—even against some decent bots. The game will also randomly reward you with crates that contain cosmetic upgrades for your weapons and clothing. $15, www.counter-strike.net

DEUS EX: HUMAN REVOLUTION - DIRECTOR'S CUT

This sci-fi stealth-action-RPG hybrid maintains the cynical tone, grand scale, and moral quandaries of the original game, while pushing forward with triple-A production values, including an excellent soundtrack by composer Michael McCann. With latitude for stealthy, guns-blazing, and completely non-lethal approaches, the game rewards multiple playthroughs. $20, www.deusex.com

FALLOUT: NEW VEGAS ULTIMATE EDITION

Developed by some of the people who made the original Fallout games, FNV brings a meatier story and lighter tone than Fallout 3, and it moves us from the DC wasteland to the Southwestern desert. Combined with mods and story DLCs, you could easily lose a hundred hours to this game. $20, fallout.bethsoft.com

FTL: FASTER THAN LIGHT

This top-down sci-fi rogue-like has you hurtling through dangerous stretches of unknown space as you evade a fleet of ships bent on eliminating the last remnants of a failed rebellion. Highly tactical and random, you increase your odds of survival through unlocking different ship types and gathering the right collection of crew and weaponry. A big free update may be out by the time you read this, too. $10, www.ftlgame.com

GNOMORIA

This sandbox village-management game is kinder, gentler Dwarf Fortress. Build your town into a city and defend it from enemies, craft a slew of items, explore your randomly generated surroundings, and be charmed by the 16-bit art style. This was still in "Early Access" mode at press time, so gameplay was still evolving. Your mileage may vary. $8, www.gnomoria.com

LEGEND OF GRIMROCK

This first-person dungeon crawler hearkens back to old-school titles like Eye of the Beholder, but with updated graphics and sound. Lots of puzzles and secrets lay before you as you attempt to escape the prison that you have been unjustly thrown into. Steam provides Workshop support, and the community has put together hours of additional levels, enemies, and items. $15, www.grimrock.net

MONACO: WHAT'S YOURS IS MINE

This top-down, team-based game is about breaking into banks, museums, and mansions. You can play alone or online and choose from a variety of character classes, like hacker, locksmith, or pickpocket. It's received a couple of large, free updates and has Workshop support to greatly increase the amount of content. $15, www.monacoismine.com

SPELUNKY

In this charming, side-scrolling indie platformer, death is permanent but usually educational and entertaining. Randomly generated levels, full destructibility, content unlocks, local co-op, and daily challenges await the patient and adventurous. It also has full gamepad support and performs well on older PCs. $15, www.spelunkyworld.com

HOW TO BE A FRUGAL FRAGGER

Humble Store In addition to weekly and semi-monthly bundle sales, the Humble Bundle guys now have a 24/7 storefront with daily deals. They reportedly take a smaller cut than Steam, and they frequently match Steam's sale price, so it's a good place to check before making your purchase. They still sell Steam keys, along with DRM-free downloads and sometimes Android versions. Ten percent of all proceeds go to charity. www.humblebundle.com/store

Cheapshark This is one of the better sale aggregators on the web, pulling prices from a dozen different reputable online stores. You can specify a price range and sort by multiple criteria, like release date, Metacritic score, and title, and you can sign up for price alerts, too. www.cheapshark.com

GOG.com If you don't want to deal with DRM, GOG.com is your new best friend. Its library of games also stretches back to the DOS days (Wing Commander, Master of Orion, Ultima Underworld), but they're tuned to be playable out-of-the-box on a modern OS. GOG frequently bundles soundtracks, wallpaper, and artwork with each game. It is owned by CD Projekt Red, the makers of the Witcher games. www.gog.com

Amazon Amazon is another good place to check, because it frequently offer credits towards future game purchases, and you can get credit cards that award bonus points for shopping there (such as Amazon's owned branded Visa card, which currently gives you a $30 credit if you're approved). And with its buying power, you'll sometimes find better sale prices than anywhere else. www.amazon.com

Vendor Bundles Nvidia and AMD have been bundling a lot of games with their cards lately, but sometimes the buyer already owns them or just isn't interested. This is where eBay comes in. Since the games came free of charge, resell prices are customarily lower than retail. www.ebay.com

BUILD A $600 PC

YOU DON'T NEED TO BE A BITCOIN BARON TO AFFORD A DECENT PC

In the Blueprints section of our mag, we have a "budget" template in every other issue that's priced between $750 and $800. But this is the Cheapskate's Guide, baby, so we crank up your savings to 11. There will be some unavoidable casualties along the way, but we try to make quality not be one of them. This build won't have an optical drive, or much RAM, or anything fancy, really. But it'll play your games and tweet your Facebooks 'til the break of dawn.

UNLOCKED
FX
PROCESSOR
AMD

CPU

AMD FX-6300

AMD is still the king of the budget build, and its hexa-core FX-6300 fits right in with a compelling combo of price and performance. Its clock multiplier is also unlocked, if you want to squeeze out some extra performance (but we'd recommend an aftermarket CPU cooler for that).
$110, www.amd.com

MOTHERBOARD

MSI 970A-G46

This board strikes a very good balance between cost and performance. It's about the cheapest you'll find that has heatsinks around the CPU tray, which you need to get a decent, stable overclock. All six SATA ports are rated for up to 6Gb/s, and it has several USB 3.0 ports on the back.
$80, www.msi.com

MEMORY

CRUCIAL BALLISTIX SPORT 4GB (1X 4GB) DDR3/1600

We've seen a spike in system RAM prices ever since manufacturers started switching to making chips for mobile devices, so we're compelled to go with one stick of RAM to keep costs under control.
$38, www.crucial.com

CASE

NZXT SOURCE 210

It's important to have a case that's rigid because it won't bend out of shape during shipment, and it's not easily dented. The NZXT Source 210 is about as bare-bones as we can recommend, below which you start to encounter a lot of brittle plastic and thin panels. It has just one fan and no USB 3.0 ports, but you can address that later, when you have more scratch to throw around.
$35, www.nzxt.com

POWER SUPPLY

EVGA 100-B1-0500-KR

EVGA is mostly known for its video cards, but its power supplies are worth a mention, as well. With its two 8-pin PCI Express power cables, this 500-watt unit should handle pretty much any single-GPU video card; six SATA power cables will handle a load of internal storage devices; and its "80+ Bronze" rating indicates good energy efficiency.
$45, www.evga.com

GRAPHICS

GIGABYTE RADEON R7 260X 2GB

AMD has changed the naming convention for its video cards; the performance of this card comes in a little under a Radeon HD 7850, or Nvidia's GeForce GTX 650 Ti Boost. We bumped the VRAM from 1GB to 2GB to better handle some of the fancy games coming out in 2014. The 260X is not rocket-fueled, but it will make pretty much everything playable.
$140, www.gigabyte.us

HARD DRIVE

SEAGATE BARRACUDA 1TB 7,200RPM

We'd love to be able to put a solid-state in here, since they perform extremely fast (and silently), but our budget just doesn't allow for such luxuries. We opted for a 1TB mechanical hard drive instead, which costs a fraction of a similarly sized SSD. You could shave costs further with a 500GB hard drive, but you'll get a performance hit that isn't worth the marginal savings.
$60, www.seagate.com

OS

MICROSOFT WINDOWS 8.1 OEM (64-BIT)

The Metro/Modern desktop doesn't feel quite right for mouse-and-keyboard input, but as long as you stick to the regular desktop mode, Windows 8.1 should feel snappy and functional. It also has very good Wi-Fi and Ethernet support out of the box, making initial setup smoother.
$100, www.microsoft.com

TOTAL PRICE: $608

When we built our last Cheapskate rig 18 months ago, it actually wasn't hugely different. We still have 4GB of system RAM, an AMD board using the 970 chipset, a 1TB Seagate drive, and a basic mid-tower and power supply. Upgrading the CPU from a Phenom II X4 965 was sorely needed, since that chip has been around for five years now. And a Radeon HD 6850 with 1GB of VRAM isn't going to push a lot of triple-A pixels these days. These new replacements aren't going to give you a night-and-day difference, either. This is more of an evolution than a revolution.

This system also has room for expansion. You can put an FX-8350 in there, increasing your CPU cores from six to eight. You can drop in a fancy video card to match it, up to and including a Radeon R9 290X, or a GeForce GTX 780. The Source 210 case has a large number of fan mounts, room for long video cards, decent cable routing, and even a vent below the power supply mount. To install Windows without an optical drive, though, you'll need a couple of extra steps. We have a guide for that, too: http://bit.ly/198H4GQ.

KEYS TO

ESC
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
F11
M1
M2
M3
M4
M5
TAB
CAPSLK
SHIFT
CTRL
FN
ALT
MACRO

VICTORY

HAVING THE RIGHT KEYBOARD CAN MAKE ALL THE DIFFERENCE IN GAMES. WE TEST SIX OF THE LATEST PREMIUM PLANKS

BY ALEX CASTLE

A great gaming keyboard is more than just a peripheral. It's a tool that can boost your productivity, give you a major competitive advantage, and make your computing time more comfortable and more fun. It's also a way to express yourself—with the dozens of keyboards on the market, picking the right one says a lot about what kind of gamer you are, and what you find important. Hell, if you're like a lot of gamers, a top-notch gaming keyboard might well be the prettiest thing in your computer room.

So, if you're still using an old, worn-out plank, this is a great time to think about upgrading. There have never been more high-quality keyboards on the market, so you'll have tons to choose from. Unfortunately, that also means that picking the keyboard that's right for you is harder than it's ever been.

To make things a little easier, we've put together a roundup of six high-end keyboards released over the last six months. We've put each one through our rigorous keyboard testing procedures, and given them verdicts based on performance, build quality, and feature set. Read on for a glimpse of the state-of-the-art in gaming keyboards.

CMSTORM MECH

CMStorm looks to get a handle on the high-end mechanical keyboard market

THE CMSTORM MECH is, first of all, a great-looking keyboard. Most of the top of the keyboard is wrapped in a subtly etched aluminum plate, and the board's geometric, asymmetrical silhouette is more imaginative than most. The aluminum plate can be removed for easy cleaning, which is a nice feature, but the seven hex screws that make removal possible mar the Mech's otherwise-excellent aesthetics.

Despite the Mech's metal-clad looks, it's not the sturdiest keyboard in this roundup. The back side of the board, and particularly the wrist rest, are made of hollow plastic that sometimes flexes and creaks under pressure. It also features a large handle on one side, and a detachable USB cable. These would be handy features for someone who takes their keyboard on the road frequently, but it's not otherwise an especially portable keyboard. It would be nice if the handle were removable or retractable, because it adds an extra two or three inches to the Mech's already substantial width.

The software support is simple and easy to use. It allows you to customize the five dedicated macro keys, or to rebind any other key on the board, and includes a flexible macro editor.

Actual typing and gaming performance is top-notch and virtually identical to the other mechanical gaming keyboards on the market. Fans of any variety of Cherry MX switch will be able to find a Mech that's right for them—CMStorm offers the keyboard with Red, Blue, or Brown switches.

In all, the Mech is a solid gaming keyboard, but doesn't quite live up to its top-of-the-line $160 price tag.

The Mech is a big mechanical keyboard, but isn't quite as sturdy as it looks.

VERDICT 8

CMStorm Mech

$160, www.cmstorm.com

MAD CATZ STRIKE 3

Is a less-extravagant Strike a better deal?

THE STRIKE 3 is the least expensive in Mad Catz's line of high-end gaming keyboards, but it's by no means a piece of budget hardware. If the $100 price tag doesn't convince you of that, seeing the Strike 3 in person will.

It's designed to look like the higher-end Strike boards, which can be split into two parts and rearranged, but this one doesn't actually come apart. Build quality is good overall, with a removable wrist-rest and a pair of USB passthroughs. The board comes in glossy black, red, and white, and features customizable backlighting.

The Strike 3 isn't mechanical, which weakens the credibility of this $100 keyboard, but Mad Catz hasn't ignored key quality altogether. The dome switches on the Strike 3 are some of the best we've felt, with a crisp actuation that feels almost, but not quite, as good as a mechanical model. They definitely feel better than any of the other non-mechanical boards we tested for this roundup.

The Strike 3 features five dedicated macro keys on the right side of the board, and seven macro buttons at the top-left. The left-side buttons, unfortunately, are pretty abysmal. They're tiny, far away from the home row, and strangely wiggly in their sockets—we found it virtually impossible to hit a particular one without looking.

The Strike 3 is a good keyboard, but we would generally recommend a mechanical board if you're looking to spend this much. If you personally prefer non-mechanical switches, however, this would be an excellent choice.

The seam down the middle of the Strike 3 is just for show—this keyboard's only one piece.

VERDICT 8

Mad Catz Strike 3

$100, www.madcatz.com

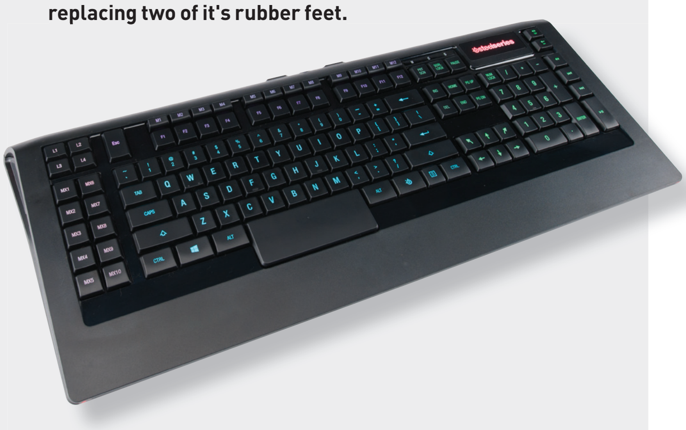
STEELSERIES APEX

All the keys you could want, and then some

SOMETIMES, MORE is more. That seems to be the guiding principle behind the SteelSeries Apex keyboard, which comes with about as many keys as we've ever seen on a gaming keyboard. In addition to the standard full QWERTY layout with number pad, the Apex includes 10 macro keys and four layer keys down the left side, 12 more macro keys above the function row, and six dedicated media buttons along the right side. Even the arrow pad gets two extra diagonal keys. SteelSeries doesn't advertise the Apex as an MMO keyboard specifically, but it's hard to imagine what other application could make use of this abundance.

Despite its absurd inventory of keys, the Apex doesn't feel cluttered at all, and in fact looks quite nice. With its built-in wrist rest the board is pretty enormous, but the low-profile keys and customizable sectioned backlighting keep it looking sleek. The build quality is good, though not quite as hardy as SteelSeries's mechanical keyboards. The Apex includes a pair of USB passthroughs, and allows for some angle customization with a pair of swappable rear feet.

Our only real issue with the Apex is that it doesn't use mechanical keys, and even compared to other dome-switch keyboards in this roundup, like the Strike 3, the Apex's keys feel distinctly mushy. If it had better key performance, it would be a strong contender for best keyboard in this price range. As it is, we'd recommend it highly to those who prioritize lots of macro keys and great design over maximum key responsiveness.



You can prop the Apex up in the back by replacing two of it's rubber feet.

VERDICT 8

SteelSeries Apex

$100, http://steelseries.com

WHAT WE LOOK FOR IN A KEYBOARD

When we review a keyboard, we look at it on three levels. The first and most important level is basic user experience—how the board feels when you use it. This includes factors like key quality and responsiveness, layout, and build quality. Ninety-nine percent of the time, the way you use your keyboard comes down to those standard QWERTY keys, so we'll take a great-feeling keyboard over a flimsy one with a zillion features any day. We would also consider a keyboard without enough anti-ghosting/rollover for gaming usage to have failed on this basic level.

Second, we examine the board on the level of practical, value-adding features. These are what make a gaming keyboard different from a more standard keyboard, and include things like macro keys, profiles, USB/audio passthroughs, the ability to rebind any key, and media controls. Of course, there's no standard rule for what's "practical" and what's not, and we take into consideration that, for instance, the first five macro keys add a lot more value to the keyboard than macro keys number 15-20. This is also the level where we consider the keyboard's software support.

Finally, we look at the keyboard's less-essential features, and what they bring to the table. Here you'll see us talk about things like backlighting, interchangeable keycaps, and paint jobs. These are frequently surface features, designed more for showing off to other gamers than for your own use.

All of this isn't to say that we think keyboards should be boring, just that it's important they have their priorities straight. Awesome backlighting can be a great addition to a gaming keyboard, but boards with tons of bells and whistles built into a crappy or just mediocre foundation are distressingly common.

ROCCAT RYOS MK PRO

This flashy keyboard is more than just looks

BUILD QUALITY on the Ryos MK Pro is outstanding. It's all plastic, as far as we can see, but is incredibly weighty and rugged-feeling. The surface is treated with a glossy dot-matrix pattern that gives the Ryos a high-class look without leaving it as vulnerable to fingerprints as a pure-gloss keyboard. Like the last Roccat keyboard we tested, the Ryos has a non-removable integrated wrist rest. It's comfortable (particularly with the back of the board elevated on sturdy-feeling supports), but makes the keyboard take up an absolutely massive amount of desk space.

The software support for the Ryos is fine, though not outstanding. The interface is a little cluttered and at times unresponsive, but it gets the job done, allowing you to customize lighting, macros, and key binding for each profile.

A lot of keyboards have backlighting these days, but this is the first one we've tested that has completely independent lights behind every key. The color can't be changed, but you can choose which keys should light up and which shouldn't for each profile. Better still, the Ryos MK Pro comes with a few special lighting effects, which can cause pressed keys to briefly light up, or even to send out a ripple of light across the whole keyboard. It's simultaneously the most superfluous and most fun new feature we've seen in a keyboard in years.

It's hard to say that the Ryos Mk Pro completely justifies the $170 asking price—that's quite a bit more money than other very good mechanical keyboards—but it at least comes close.

LEDs in each key in the Roccat MK Pro can light up and blink independently.

VERDICT 9

Roccat Ryos MK Pro

$170, www.roccat.org

GIGABYTE FORCE K7

A budget-friendly board that's light on features

WITH A $50 MSRP, the Force K7 targets the budget-minded consumer, but still hovers comfortably above the bottom of the barrel. Any keyboard involves compromises, but with the K7, there just might be too many.

The K7 advertises "extreme short actuation distance" for its keys, which are built on laptop-style scissor switches. Keyboard feel is a matter of personal preference, of course, but for gaming we've never been very fond of scissor switches, which offer almost no tactile feedback. The key layout on the K7 is standard, though it uses the half-width backspace key and double-decker enter key configuration that's less commonly seen in gaming keyboards and makes touch typing a bit more difficult.

Build quality on the K7 is generally good—it's sturdy and feels heavy on the desk. Our review unit did, however, come with an extra 0 key instead of the hyphen key, which raises some questions about quality assurance.

If anything, the K7 is notable for its lack of gaming-specific features. It has no macro keys, no profiles, no ability to rebind keys, no USB passthroughs—none of the things that identify a keyboard as made especially for gaming. The only extra features the board does include are underwhelming three-color backlighting and a pair of thumbwheels, which can only be used to control volume and backlight intensity.

There are no glaring problems with the K7, but without a clear performance advantage, there's nothing to recommend this board over one of the low-end Logitech or Microsoft keyboards, which are similarly priced and offer a better set of features.

The Force K7 has a low profile, with laptop-style scissor-switch keys.

VERDICT 7

Gigabyte Force K7

$50, www.gigabyte.us

CORSAIR RAPTOR K50

The Cadillac of non-mechanical keyboards

If you're the kind of gamer who needs an unhealthy number of macro keys, the Raptor K50 is for you.

THE CORSAIR RAPTOR K50 is a beautifully designed board, borrowing the floating-keys design of the more expensive Vengeance boards, with just a hint of brushed aluminum along the top edge. The look is rounded out with high-quality customizable key lighting that shines through the keycaps, without leaking out around the edges of the keys. Build quality is second-to-none, and as usual, the raised-key design makes it easy to keep crumbs from accumulating under the keycaps.

The K50 is nicely feature-packed, with a USB passthrough, media keys, a large metal volume wheel, and, oh yeah, like a million macro keys. Well, 18, anyway, all in one huge bank at the left, along with dedicated buttons for switching between three macro layers and recording them on the fly. That number might be bordering on the too-many-to-actually-use zone, but some gamers might find a use for them all, and on-the-fly recording is a feature we wish more boards had. The software for the K50 works well, and onboard storage allows you to use your profiles on any computer.

We like the K50 a lot, but—at the risk of sounding like a broken record—for most users we wouldn't recommend a non-mechanical $100 board. Our recommendation at this price range would be to get a mechanical board with slightly fewer features, or to jump up an extra $30 and get a similarly feature-packed mechanical board, such as Corsair's own Vengeance K70 or K90.

VERDICT	**Corsair Raptor K50**
9	$100, www.corsair.com

THE MUMBO JUMBO

Just like every other peripheral, there's a lot of jargon used to describe features in gaming keyboards. Because these technical terms are often featured prominently on marketing material, we think it's important that anyone looking to buy a keyboard knows what they mean. Here are three of the most common terms, explained:

Anti-Ghosting/N-Key Rollover If you spent much time using an old or cheap keyboard, you probably encountered "ghosting," the phenomenon whereby a keyboard could only keep track of about three simultaneous keypresses. If you wanted to jump, sprint, circle-strafe, and throw a grenade all at once, your keyboard would likely flub the input. Anti-ghosting, or "n-key rollover," allows you to hit tons of keys at once with no problems. At this point, every decent gaming keyboard offers this feature, and we would never buy one without it.

Mechanical Keys The latest improvement in high-end gaming keyboards is the (re)introduction of mechanical switches. There's a ton that could be written about this technology, but what you really need to know is that almost everyone uses Cherry MX switches, and that they come in different colors, such as "Cherry MX Blue," which each represent a different responsiveness and feel. For a full primer on switch types, visit http://bit.ly/JwpUYh.

ENDLESS OPTIONS WITH CONFIGURABLE
PER-KEY ILLUMINATION
EXTREME CUSTOMIZATION
FULLY RE-MAPPABLE
N-KEY ROLLOVER FOR ADVANCED
ANTI-GHOSTING
TWO POWERFUL 32-BIT ARM
CORTEX PROCESSORS
COMPLETE WITH INDUSTRY-LEADING
CHERRY® SWITCHES
ESC
M1
M2
M3
M4
M5
STRG

ARM Processors The latest fad we've noticed in keyboard marketing is to brag about the number of microcontrollers inside a gaming keyboard. Though the box blurb is usually written to make it sound like there's a high-powered smartphone proc toiling away inside the keyboard, they are very low-powered, and exist to enable specific features, like onboard profiles or per-key backlighting. In short, ignore this and focus on what the keyboard can do for you.

Yes, the Haswell NUC is actually this small.

Actual-Size Computing

WE TOUR THE BURGEONING WORLD OF WEE PCS

BY GORDON MAH UNG

In case you haven't noticed, the PC is getting smaller. But it's not getting smaller in the way the PC fatalists see it. If anything, *enthusiast* PCs have gotten *larger*. Witness Corsair's 900D, Cooler Master's Cosmos SE, and Digital Storm's Aventum II.

The truth isn't that the PC is getting smaller and thus going away; the truth is that for enthusiasts, there's interest in gigantic PCs, small micro-towers, and now—Intel hopes—ultra-compact form factor (UCFF) PCs no larger than a book. All of which serve unique purposes, and thereby highlight the PCs unmatched versatility.

UCFF PCs as a category aren't new, of course. They've been around for years, but their performance has always been fairly underwhelming and they've always consisted of specialty hardware, to be embedded into an ATM or smart soda machine.

But now that these compact computers are more capable than ever, readily available, and easily built, there's no telling what new and interesting applications will spring forth. Is Intel actually onto something big with its new Next Unit of Computing (NUC) initiative?

NEXT UNIT OF WHAT?

INTEL'S PUSH TO MAKE THE DESKTOP SMALLER

Intel is even offering a limited-edition customized Dragon NUC.

Trying to figure out the actions of the world's largest chip company can be confounding to consumers who don't fully appreciate Intel's size-13 footprint on the PC industry and its ability to single-handedly change the game.

Sometimes when Intel sees a niche it thinks needs to be filled, it tries to jump start it from scratch. The company tried and failed, for example, with its Common Building Block program that was meant to create a DIY-laptop world with standardized power bricks, hard drives, optical drives, LCD panels, keyboards, and battery packs. While CBB never took off, many of the fruits of that effort are still with us.

Now, Intel is attempting to both create and fill a niche again with its Next Unit of Computing, or NUC (rhymes with "luck"), a new ultra-compact form factor that the company hopes will push performance computing into unheard-of places.

Unlike the CBB program, which was totally reliant on the participation of parts makers and laptop builders, NUCs are actually built and sold by Intel itself. In a nutshell, NUCs are simply 4x4-inch computers packing as much power as possible.

From what we can tell, Intel's actions aren't intended to drive others out of the market. In fact, Intel seems to be trying to invite others into the NUC game. Thus far, Gigabyte has jumped in with its NUC-style Brix boxes that are proving to be fairly innovative. There are also other smaller and lesser-known brands and embedded-PC vendors in there, as well.

Unlike Thin ITX (which you can read about on page 56), NUC-style boxes aren't designed around industry-standard specs. The only things common between the NUC and Brix, for example, are the footprint, the power brick, and other mobile components they accommodate. You won't, for example, be able to swap a motherboard from a Brix into a NUC because these PCs are generally customized to the chassis they're in.

CHALLENGES TO NUC

One of the challenges NUC and its ilk share is the limited board space. At 4x4 inches, jamming in features has meant adding more layers to the motherboard. While typical ATX motherboards feature six- or even four-layer PCBs, NUCs' are 10-layer. Adding layers isn't cheap, either. For example, in a 10-layer ATX motherboard—which you might see with a dual-proc board, where additional layers are needed to run all the traces of both processors—the PCB itself costs about $90.

The path going forward for NUC isn't to blow them up in size, either. Rather than making them, say, 5x5 inches or more in the future, Intel says it's more interested in getting a 65-watt TDP processor to work reliably in a package of NUC's current size. Of course, adding a hotter CPU means more cooling and a bigger and more power-hungry power brick, too.

NUC SALES

So, are NUC and NUC-style devices resonating with consumers? Intel didn't give us exact sales figures, but it says it has seen healthy demand, with quarter-on-quarter growth from 30–50 percent. Interestingly, Intel says that even after it offered a lower-cost Celeron version using the Sandy Bridge microarchitecture, the demand has mostly been at the high end, with consumers actually preferring the initial Ivy Bridge Core i5 version.

That's another reason Intel thinks that NUCs aren't actually hurting the desktop. In fact, Intel believes the demand for a lot of performance, albeit in a tiny package, will reinvigorate the desktop, as people seek to put a PC in places they never could before.

INTEL NUC D54250WYK

HASWELL COMES TO THE NUC

After a puzzling first effort, Intel offers nearly all you could ask for in its NUC follow-up.

THE ORIGINAL Intel NUC DC3217BY we saw in late 2012 was an odd duck. The case was maroon and black, and while it showcased Intel's newfangled Thunderbolt connectivity, there were no Ethernet, USB 3.0, or analog audio out.

Intel cited limited board space as the reason for the port selection on that model (to be fair, Intel did offer a dual-HDMI version with gigabit Ethernet and a single USB 3.0 port) and soldiered on despite the skepticism over the device. That's good news because the latest NUC leaves few questions unanswered.

The newest Haswell NUC D54250WYK shares the same footprint as the original NUC but sits about an eighth of an inch shorter. Rather than the Core i3-3217U in the original NUC, the top-end Haswell NUC features a 1.3GHz Core i5-4250U that will Turbo Boost up to 2.6GHz. There's no lack of ports on this unit, either. The Haswell NUC includes a Mini Display Port, Mini HDMI, gigabit Ethernet, four USB 3.0 ports, analog audio out, and an infrared port.

Internally, there's a pair of DDR3 SO-DIMM slots and stacked Mini PCIe slots that let you install an mSATA drive and wireless card. The original NUC had overheating issues that caused some of the mSATA drives to error out. Intel has apparently addressed this by tweaking the fan and adding a thermal pad that rests on the mSATA drive. The shell in all NUCs is prewired for Wi-Fi. The motherboard in this NUC also features a SATA 6Gb/s port and a port for SATA power, too. Intel apparently plans to use the same board in a future NUC that will be tall enough to support cheaper and far larger notebook hard drives. The motherboard itself is an Intel design and features a beautiful UEFI as well as the QS87 chipset.

SPECIFICATIONS/BENCHMARKS

	Haswell NUC	Ivy Bridge NUC
Model	D54250WYK	DC3217IYE
CPU	1.3GHz Core i5-4250U	1.8GHz Core i3-3217U
Graphics	HD5000	HD4000
Ports	Mini HDMI 1.4a, DisplayPort 1.2, 4x USB 3.0, gigabit Ethernet, analog audio out, IrDA, Kensington lock port	2x HDMI 1.4a, 3x USB 2.0, gigabit Ethernet, Kensington lock port
Stitch.EFx (sec)	**1,747**	2,453
ProShow Producer (sec)	**2,567**	3,729
3DMark Cloud Gate	**3,958**	3,409
3DMark Ice Storm	32,157	**35,969**
Counter Strike Source (fps)	**63.23**	52.4
Google Octane 2.0	**17,832**	10,643
Power Consumption Idle (watts)	**5**	8
Power Consumption Prime95+Furmark (watts)	**24**	35
Power Consumption YouTube 1080p (watts)	19	**14.5**

Best scores are bolded.

Performance isn't a primary concern for people who run these mini PCs, but we decided to see how this Haswell NUC stacked up against the original NUC. That unit features a 1.8 Core i3-3217U CPU on the Ivy Bridge microarchitecture. Both NUCs are dual-core Hyper-Threaded parts, so the only real performance difference is due to the Turbo Boost of the Haswell and the newer microarchitecture. As expected, the Core i5 gave the original Ivy Bridge a pasting in CPU-related tasks. In graphics, it's closer between the HD4000 and HD5000, but the Haswell part generally was in front. Oddly, the Ivy Bridge NUC came out on top in 3DMark Ice Storm, which tests basic graphics performance, but fell back in 3DMark Cloud Gate. Neither NUC is suited for serious gaming, but in the 10-year-old Counter Strike: Source graphics stress test, both gave acceptable frame rates at 1080p.

We measured power consumption of both NUCs using the same power load and the same power brick (both were outfitted with similar parts, too). On idle, the Haswell unit drank about 5 watts versus the 8 watts of the Ivy Bridge unit. We also tried a worst-case scenario with Prime95 and Furmark running simultaneously. The Haswell used 24 watts to the Ivy Bridge's 35W. While watching a 1080p video on YouTube, the Ivy Bridge unit used but 14.5 watts, interestingly, while the Haswell NUC used 19 watts.

The Haswell NUC is likely the fastest NUC available today, as no one has figured out how to shoehorn a quad-core into the unit. But it's not cheap. We found the unit on the street for about $375. Before you balk, remember that you're getting a kit that includes the CPU and PSU. Yes, you can get a cheaper system by going larger—but if you want small and fast, this is the best yet.

VERDICT
8

Intel NUC D54250WYK

$375, www.intel.com

GIGABYTE BRIX PROJECTOR GB-BXPI3-4010

A POCKET-SIZE THEATER

INTEL'S GOAL with the NUC initiative was to create a new category of computing. What that category would be or how it would be used, the company didn't really know when it started.

While Gigabyte has several NUC-style clones, dubbed the "Brix" line, the one that really captured our interest is the Brix Projector. Yup, a UCFF PC with a DLP pico projector and 1.5-watt speaker integrated into it. The projector isn't super bright, but it outputs a decent 75 ANSI-rated lumens. That means you won't be using it outdoors in the daylight or in a very bright room, but it's far better than the first 15-lumen pico projectors of yesteryear. It offers enough light that Gigabyte rates the device as being capable of projecting on a screen up to 85 inches. Resolution is also average at 864x480, or WVGA res, but that's pretty standard for most pico projectors that are still actually "pico." We'll also note that lower resolutions are actually quite passable for media projection. Gigabyte even had the foresight to integrate a standard tripod mount into the base of the PC, too.

Inside the Brix Projector you'll find a pair of DDR3 SO-DIMM slots, and the same stacked layout to take mSATA and Wi-Fi cards as in Intel NUCs. External ports are also generous, with four USB 3.0, gigabit Ethernet, a Mini DisplayPort 1.2, full-size HDMI 1.4a, an analog jack that pulls double duty as optical a S/PDIF output, and a Mini HDMI-in port should you want to use the unit as a projector from another device.

SPECIFICATIONS/BENCHMARKS

	Brix Projector	**Ivy Bridge NUC**
Model	GB-BXPi3-4010	DC3217IYE
CPU	1.7GHz Core i3-4010U	1.8 Core i3-3217U
Graphics	HD4400	HD4000
Ports	HDMI 1.4a, Mini HDMI in, Mini DisplayPort 1.2, gigabit Ethernet, 4x USB 3.0, analog audio, S/PDIF	2x HDMI 1.4a, 3x USB 2.0, gigabit Ethernet, Kensington lock port
Stitch.EFx (sec)	**2,441**	2,453
ProShow Producer (sec)	**3,564**	3,729
3DMark Cloud Gate	**3,667**	3,409
3DMark Ice Storm	26,475	**35,969**
Counter Strike Source (fps)	**53.29**	52.4
Google Octane 2.0	**11,624**	10,643
Power Consumption Idle (watts)	**7.5**	8
Power Consumption Prime95+Furmark (watts)	**24**	35
Power Consumption YouTube 1080p trailer (watts)	19	**14.5**

Best scores are bolded.

Yup. There's indeed a projector integrated into this PC that's no bigger than a Wendy's Baconator.

The CPU in the model we reviewed is a Haswell 1.7GHz Core i3-4010U with HD4400 graphics. Again, extreme performance isn't a key metric for people looking at this class of device, but we were still interested to see how it did against the Ivy Bridge Intel NUC DC3217IYE. Remember, both the Intel Ivy Bridge NUC and the Brix have Turbo Boost disabled at the factory. Despite the Ivy Bridge NUC having a 100MHz advantage, the Brix Projector was slightly faster in some tests. In other tests, though, both were dead even. Clearly, if you really need the performance in a UCFF, pony up for a Core i5 part.

In general, power consumption on idle was slightly higher (using an external monitor) with the IB NUC; under our CPU- and GPU-heavy loads and simply playing a 1080p YouTube video, the Brix was on par with the Haswell Intel NUC. As with that PC, the Brix Projector consumed more power than the older Ivy Bridge NUC playing the 1080p video.

Using the Brix Projector is a hoot. The graphics signal, you should know, is passed internally, so there's no hooptie external pass-through cable. You can actually run both the projector and an external monitor simultaneously.

Overall, it's a slick little unit. The question is, what would a normal person need it for? The answer is, most of us wouldn't need it. But don't take that to be a negative. There are certainly specialized applications for it, such as media installations, commercial applications, or even an ad-hoc mini-theater setup for the kids. Again, it's not everybody's cup of tea, but the fact that you can get a "real" computer with a 75-lumen projector is pretty mind-boggling.

VERDICT
7

Gigabyte Brix Projector

$600, www.gigabyte.us

GIGABYTE BRIX PRO

FASTER THAN A TOWER. REALLY

GIGABYTE
SS
Ω / SPDIF

The Brix Pro packs in more performance per cubic inch than any system we've ever tested.

IN THE LAND of ARM and off-brand x86 parts, the dual-core Core i3 is king. After all, when we talk about the "high-performance" needs of UCFF users, the performance of a Haswell-based CPU or even an Ivy Bridge part is like going back in time and landing a P-51 Mustang next to the Wright brothers after they just touched down at Kitty Hawk.

Following that same analogy, you can think of Gigabyte's blisteringly fast Brix Pro as an X-Wing fighter making a fly-by, wagging its wings, and then flipping the bird before making the jump to light speed. We're not kidding, either. The Brix Pro is simply the fastest NUC-style UCFF we've ever tested. We actually watched it outpace our full-tower, six-core 3.2 Core i7-3630K that's clocked full-time at 3.9GHz.

The secret is Gigabyte's ability to magically integrate a full-on Core i7-4770R in the Brix Pro. The Core i7-4770R "Crystalwell" is no mere Haswell part. Its main claim to fame is 128MB of super-fast embedded DRAM on the CPU package that acts as gigantic L4 cache (a Core i7-4770K's L3 cache is 8MB). This cache greatly increases bandwidth for graphics operations and puts it on par with GeForce GT 650M discrete graphics. Since it acts as L4 cache, it can also greatly aid some application workloads, too. And no you can't buy it, it's only available soldered to motherboards. Oh, and it's a full-on desktop-class quad-core Hyper-Threaded i7 chip that'll hit 3.9GHz on Turbo.

Physically, the Pro is about 2.5 inches tall, making it about half an inch taller than the Intel Haswell NUC on page 51. That height, though, gives the Brix Pro the capability to mount a 9.5mm 2.5-inch notebook drive. The motherboard still has an mSATA slot, so you can run an SSD as well as one of the upcoming 2TB 9.5mm hard drives.

Like other NUC-style machines, besides the mSATA slot, you'll also find a mini PCIe slot that Gigabyte has already populated with an 802.11ac, as well as two SO-DIMM slots. There's a single integrated power and SATA connector for the 2.5-inch drive, as well.

On the performance tip, as we said, the Brix Pro smokes all other NUCs. That's not a surprise, as it's a quad-core part going up against dual-core parts. And we don't mean a wisp of smoke—it's a full four-alarm smoke-out with the Brix Pro offering 200 percent performance increases over the Ivy Bridge NUC and from 82–163 percent increases over the Haswell NUC. This desktop Haswell-R part is so fast, it slightly outpaced our desktop zero-point system in ProShow Producer 5 and was slower by just 4 percent in Stitch.Efx 2.0 runs. Yes, faster than a six-core overclocked machine that's 30 times bigger. Granted, the tower will eat it in multithreaded tasks and gaming, but the fact that a machine smaller than a retail CPU box can be faster than a mid-tower machine is incredible.

There's a cost, though. When you're hammering it with a heavy workload, it gets a little whiny. It's not horrible, but you will hear the fan under very heavy loads. It also drinks more. The CPU has a TDP rating of 65 watts and under extreme CPU and GPU loads, we saw at-the-wall power usage hit near 90 watts. Most of the time though, power consumption is quite reasonable. The last issue is cost. This bare-bones kit will set you back $650. Much of that is the CPU ($400), but either way, we know there's a price for miniaturization. At least with the Brix Pro, you're getting a hell of a lot of performance.

SPECIFICATIONS/BENCHMARKS

	Brix Pro	Ivy Bridge NUC
Model	GB-BXi7-4770R	DC3217IYE
CPU	3.2GHz Core i7-4770R	1.8GHz Core i3-3217U
Graphics	Iris Pro 5200	HD4000
Ports	HDMI 1.4a, DisplayPort 1.2, 4x USB 3.0, gigabit Ethernet, Kensington lock port	2x HDMI 1.4a, 3x USB 2.0, gigabit Ethernet, Kensington lock port
Stitch.EFx (sec)	**867**	2,453
ProShow Producer (sec)	**1,410**	3,729
3DMark Cloud Gate	**10,406**	3,409
3DMark Ice Storm	**68,195**	35,969
Counter Strike Source (fps)	**149.43**	52.4
Google Octane 2.0	**26,893**	10,643
Power Consumption Idle (watts)	8	8
Power Consumption Prime95+Furmark (watts)	87	**35**
Power Consumption YouTube 1080p trailer (watts)	20	**14.5**

Best scores are bolded.

VERDICT 9 KICK ASS!

Gigabyte GB-BXi7-4770R

$650, www.gigabyte.us

DIY NUC

YOU CAN ROLL YOUR OWN NUC—BUT SHOULD YOU?

To a DIYer, "building" a NUC is a bit of an insult. You basically buy a NUC or Brix, slot in two SO-DIMMs, a Wi-Fi card, an mSATA drive, and install the OS. If you posted such a "build" on YouTube, the hazelnut gallery would come out of the woodwork to rip you a new one in the comment section.

All is not lost, however, for true wrenchers who want to actually build a UCFF PC from scratch, so-called kits be damned. We just wonder whether it makes much sense, because at this point there are a lot of barriers to entry to building your own.

The first issue is getting a chassis. Intel has told us it really sees these devices as being purely custom computing options with the base NUC and NUC-style machines. While Mini-ITX and Thin ITX (more on that on page 56) feature standard I/O shields like their bigger siblings, ATX and microATX, NUC doesn't have any standardized cutout for system I/O. That means any chassis would have to be built to take one of the multiple NUC motherboard port arrangements currently available. So don't just buy a NUC motherboard and a NUC chassis without making sure they match. Most vendors will specify which NUC motherboard the chassis will fit.

To experience what it would be like to build our own NUC, we ran with a Silverstone PT14 chassis. This aluminum chassis comes with an I/O shield for either the dual-HDMI-port Ivy Bridge boards or the Thunderbolt version. Our PT14 is the dual-HDMI version.

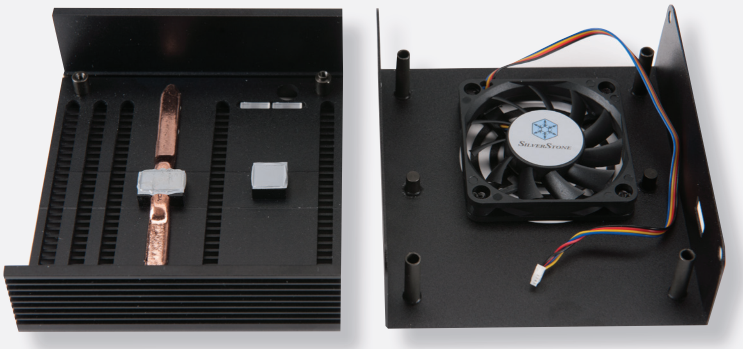
The next issue is securing the NUC motherboard. Intel isn't fully committed to supporting a DIY ecosystem, so rather than selling individual boards, it's selling 10-packs of motherboards intended for system builders or integrators. In a bit of a wink, wink, nod, nod, though, some of the bulk packs of motherboards are broken up and sold to end users. This, of course, raises questions about warranty support, but according to LogicSupply.com (a popular vendor of embedded systems that seems to stock most of the esoteric NUC parts), the warranty for the boards are covered directly by Intel even if purchased stand-alone, so it seems Intel will stand behind them.

DIY NUC-STYLE

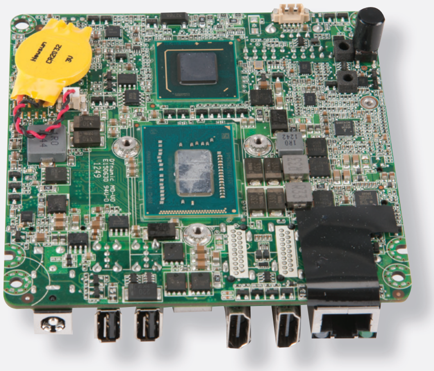
Silverstone Petit PT14 chassis	$40
Intel D33217GKE mobo/CPU	$310
19V power brick	$16
Wi-Fi antennas	$10
Windows 8 OEM OS	$99
Adata 8GB DDR3/1333 RAM	$65
120GB Crucial mSATA drive	$108
Intel 802.11ac Wi-Fi card	$34
TOTAL	$682

PARTS OF A WHOLE

THE ESSENTIAL COMPONENTS OF A DIY NUC



The Silverstone PT14 NUC chassis dissipates heat using a heat pipe with a fan blowing air out the bottom.



This Intel D33217GKE NUC motherboard isn't packaged for consumers, but you can still buy them with apparent warranty support from Intel.

BARE-BONES INTEL NUC

Intel DC3217IYE	$255
Windows 8 OEM OS	$99
Adata 8GB DDR3/1333 RAM	$65
120GB Crucial mSATA drive	$108
Intel 802.11ac Wi-Fi card	$34
TOTAL	$561

The board we went with was an Intel DC33217GKE "Golden Lake" motherboard. It comes with an integrated heatsink and fan—which won't work, as the PT14 chassis features an integrated heat pipe that connects directly to the chassis. Since the CPU is 17 watts, it's possible to dissipate much of the heat through the chassis. Our Golden Lake motherboard came with a standard Intel cooler, which we unscrewed by first removing the two visible screws holding down the fan. We then removed the three fans holding down the heatsink and gently removed it from the board. The PT14 does have a single fan that's set to exhaust air out the bottom of the chassis.

From there it's as simple as screwing the motherboard to the top of the chassis, populating the RAM, Wi-Fi card, and mSATA, installing the power button, and you're done. All told, it took us about 15 minutes to roll our own NUC going at a leisurely pace so as not to forever lose the screws. We'll note that the Wi-Fi antennas didn't come with our 802.11ac card (they typically don't) so you'll have to secure a pair of rubber duckies with cables (just Bing "rubber wifi antenna and internal cable," select Image, and search for the rubber duck antennas with internal cables. They're typically under $10.)

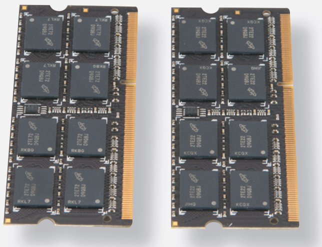
Before you're done, though, you'll also need to buy the 19-volt power brick. Intel actually sells them on its NUC parts page for $15, or they can be found at retailers for $16, typically.

There, you're done. You've just built your first Next Unit of Computing. It wasn't difficult and it's kind of fun. But does it make sense?

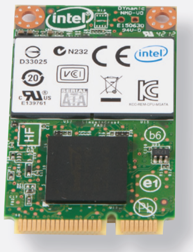
No, not at all. Not once you run the numbers. The parts to build your own NUC from scratch cost about $682 (including $99 for the OS). If you had bought a NUC bare-bones system and added the same 802.11ac, mSATA, and RAM from the DIY package you would spend $561. Ouch. And that's without having to search through Uncle Jim's used computer store for a pair of rubber duck Wi-Fi antennas and finding someone who actually sells NUC chassis. From a fiscal point of view, it makes no sense whatsoever. Even our standard edict that building your own box gives you control over the parts, fan placement, and appearance doesn't apply because, really, is there that much of a difference?

Again, Intel says it's not sure where it's going with NUC as a DIY proposition and that's apparent to us, because the real kick in the gut here is the motherboard. A NUC bare-bones kit with motherboard, power brick, chassis, and internal Wi-Fi antennas is $255 on the street. The best price we could find for the NUC motherboard alone was $310. Perhaps if Intel decides to make the price of the NUC boards more reasonable the DIY angle will make sense. Today, it's a waste of scratch no matter how you cut it.

> “
>
> DON'T JUST BUY A NUC MOTHERBOARD AND A NUC CHASSIS WITHOUT MAKING SURE THEY MATCH



With NUC, you'll want higher-clocked RAM modules and a dual-channel config if you care at all about 3D performance.



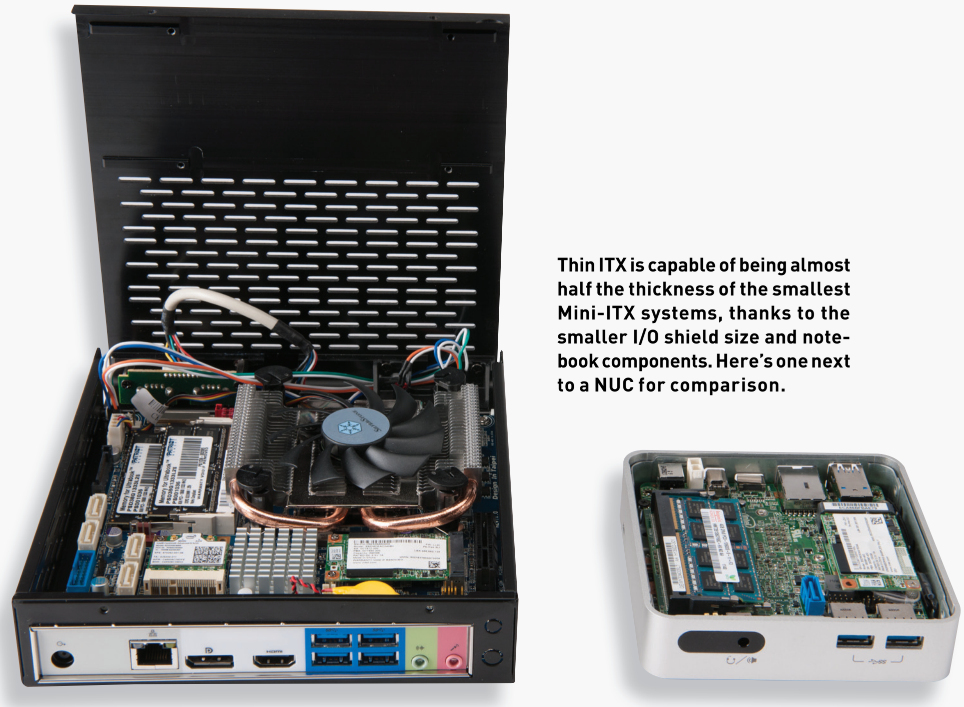
Like most NUCs, our DIY takes an mSATA drive. Newer units, however, will take 2.5-inch drives at the cost of space.

You'll need a Mini PCIe card for networking, and have to secure a pair of rubber duck antennas or internal patch antennas (not pictured).

The NUC and Brix units all share the same basic 65-watt power supply.

THIN ITX

THE OTHER UCFF YOU'VE NEVER HEARD OF



Thin ITX is capable of being almost half the thickness of the smallest Mini-ITX systems, thanks to the smaller I/O shield size and notebook components. Here's one next to a NUC for comparison.

You know everything you need to about Intel's NUC and you're probably pretty familiar with Mini-ITX, a form factor originally created by VIA, but do you know about Thin ITX? Don't be embarrassed if you don't. We've probably only written about this nascent form factor once, when we did an all-in-one-PC Build It two years ago, and hell, Thin ITX is still so niche, no one has even bothered to write a Wikipedia entry for it yet.

Thin ITX uses the same 6.7x6.7-inch footprint as Mini-ITX but considerably reduces the I/O shield "cutout" to about half its size. While most Mini-ITX boards tend to use desktop RAM and components, Thin ITX uses SO-DIMMs, mSATA, and Mini PCIe connectors. One key feature of many Thin ITX boards (at least thus far) is the use of a desktop socket, which lets you build your system on your terms.

Most of the coolers we've seen limit you to 65-watt TDP parts and the motherboards mostly max out at 84-watt TDP parts. You'd think that would limit you to Core i3 procs, but Intel actually makes low-wattage Core i7 "S" and "T" parts that fit that power envelope. If you wanted, you could actually build a 1.5-inches-tall Thin ITX box packing a Core i7-4770S quad-core with Hyper-Threading that Turbos up to 3.9GHz.

Before you get too excited, however, know that Thin ITX is far from NUC-easy to build. The chassis are so thin, you'll need a low-profile cooler that's specifically meant to fit it. In our case, we used Silverstone's PT13B chassis along with the matching low-profile AR04 cooler. The PT13B allows you to mount a 2.5-inch drive inside the case. Wiring inside the case gets fairly tricky—Silverstone's new CP11 super-thin cables would be a good idea here. One other thing you'll need to think about with Thin ITX is an external power brick. Motherboard maker Gigabyte is recommending a 180-watt brick for 84-watt TDP CPUs and a 150-watt brick for everything lower. Unlike many of the Mini-ITX thin cases that need internal DC-DC converters, the power brick can be plugged directly into the Thin ITX boards. The boards have four PCIe slots, but discrete graphics is still out of the question. It's a problem that really hurts Thin ITX in our eyes. Intel has designed Thin ITX to be used in mini PCs as well as all-in-one systems and thus also includes an internal LVDS connector for the panel in an AiO. Undoubtedly, this makes it pretty difficult to design for discrete graphics. It seems that Intel's long-term goal is to just improve its own GPU to the levels needed for the average UCFF user.

The last consideration is price. We built a box using the PT13B, a Gigabyte H87-TN board, a Core i3-4130, a 150-watt power brick, an AR04 cooler, and the same mSATA drive, 802.11ac card, and 8GB of DDR3/1333 we used in our NUC build, and the price came to $681. That's shockingly close to the DIY NUC we built on page 54, as well as the new Haswell NUC we reviewed on page 31. The main difference is CPU, which in our case is a Haswell-based Core i3-4130 ticking along at 3.4GHz. We don't even have to benchmark it to know that it'll burn the 1.8GHz Core i3-3217U in the DIY NUC to the ground, as well as the 1.3GHz–2.6GHz Core i5-4250U in the bare-bones Haswell NUC. Our Thin ITX build can't touch the Brix Pro with its built-in Core i7-4770R, but at least it's cheaper.

Just remember that despite the small footprint of our Thin ITX mini PC, it's still pretty damn big compared to the NUC—there's a price to be paid for miniaturization. Still, we have to say, Thin ITX represents itself well and its flexibility is far greater than any NUC. Then again, a full tower is even more flexible, and if you wanted to go down that road, you'd be sitting in your living room with a Corsair 900D next to your HDTV in no time.

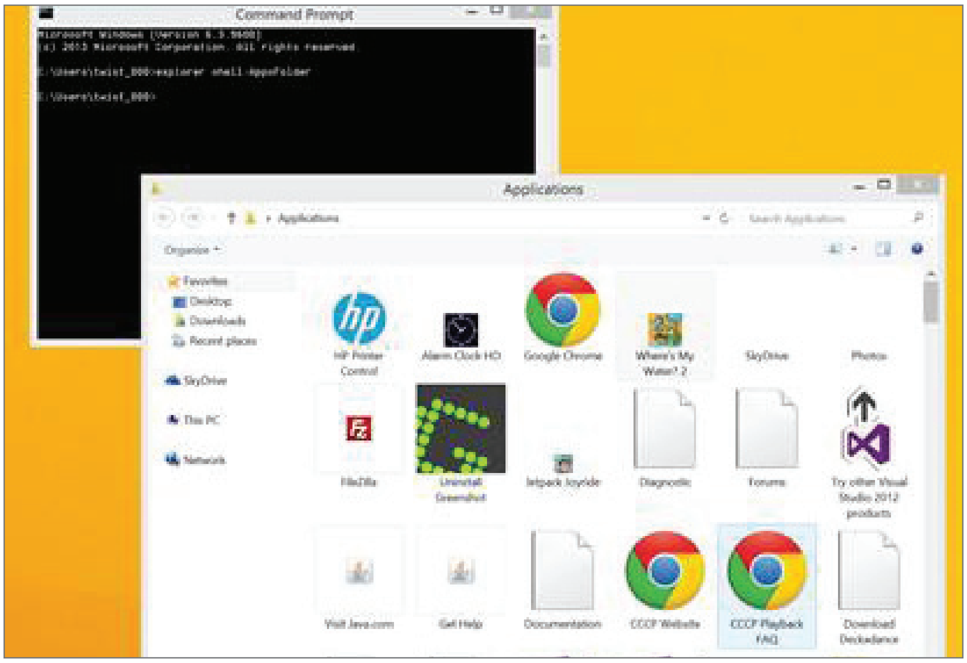
DIY THIN ITX

Gigabyte H87-TN mobo	$131
Silverstone Tek PT13B chassis	$72
Silverstone Tek AR04 cooler	$27
Intel Core i3-4130 CPU	$129
150 watt TDP power brick	$16
Windows 8 OEM OS	$99
Adata 8GB DDR3/1333 RAM	$65
120GB Crucial mSATA drive	$108
Intel 802.11ac Wi-Fi card	$34
TOTAL	$681

HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

WINDOWS TIP OF THE MONTH



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Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Users\twist_000>explorer shell:AppsFolder

C:\Users\twist_000>
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Command Prompt
Applications
Applications
Search Applications
Organize
Favorites
Desktop
Downloads
Recent places
SkyDrive
This PC
Network
HP Printer Control
Alarm Clock HD
Google Chrome
Where's My Water? 2
SkyDrive
Photos
FileZilla
Uninstall Greenshot
Jetpack Joyride
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Try other Visual Studio 2012 products
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CCCP Playback FAQ
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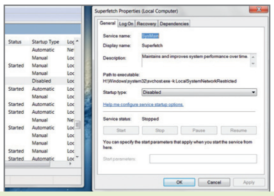
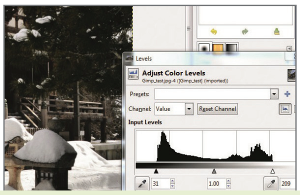
LAUNCH MODERN APPS FROM THE WINDOWS 8.1 FILE EXPLORER

If you want to skip the Modern UI entirely, but still have access to apps downloaded from the Windows app store, you can. All you have to do is open a command prompt, then type **explorer shell:AppsFolder** and hit enter. A folder will open, containing icons for all your modern apps, which you can now pin or create shortcuts for.

MAKE - USE - CREATE



62
Fine-Tune
Your SSD



64
Edit Photos
with Gimp

ALEX CASTLE
CONTRIBUTING EDITOR

WHAT WINDOWS COULD LEARN FROM SMARTPHONES

IT'S BEEN YEARS since smartphones became a part of most techies' lives, yet Microsoft still hasn't added some of their best features to the Windows experience. Here are two small features I would start with:

A better clock I love the iPhone's clock app, which bundles a multi-time alarm clock with snooze, a stopwatch, and a kitchen timer. I use all of those features at least every few days. The Windows 8 clock, on the other hand, shows you the time. There's not even a Live tile with a clock in it. You can download one from the app store, but none of the options are fantastic, and this really is a feature that should be included.

Autocorrect OK, I know all the horror stories about autocorrect fails, but would it really kill Microsoft to add a low-grade autocorrect system-wide? No wild guessing, but if I type "explian" into my browser, my PC should be able to figure out what I'm trying to get at.

↘ submit your How To project idea to: comments@maximumpc.com

Fine-Tune Your SSD

YOU'LL NEED THIS

WINDOWS 7 OR 8
This how-to works with either.

UPDATED SOFTWARE
It's best to get the latest firmware for your SSD and update your chipset drivers.

THE INSTANT INCREASE in performance you get from switching from a hard disk to a solid-state drive is quite special. You don't notice an upgraded CPU in the same way (unless you're replacing a Pentium II), and as for RAM? Forget it.

No other component transforms your everyday computer use like an SSD, which is why making sure it's running as efficiently as possible is a worthwhile endeavor.

There's a mountain of advice out there from the Internet, the IT guy in your office, and the lady down the road in the tinfoil hat regarding proper maintenance of SSDs, and often their insights are conflicting. Should you turn off the page file or not? Is Windows 7 using the Trim command correctly, or do you need an extra software layer? We're here to help. **–PHIL IWANUIK**

1 GETTING STARTED

First, let's establish what it means to "optimize" your SSD. Begin by forgetting those sequential read/write figures that manufacturers love to wheel out. They do so because a sequential-write time of 500MB/s sounds hella impressive, whereas a random-write time of 24MB/s sounds pretty pedestrian.

Guess which type of task your disk completes most often? Correct, the random writes. You can check this for yourself by downloading Diskmon (http://bit.ly/1iSAiXv)—a program that tracks every task your disk does as you go about your business for a few hours.

» Maximizing your random-read and -write times is a big part of SSD optimization, but it's not the whole story. Flash memory performance degrades over time, so it's also important to ensure you're not thrashing your SSD unnecessarily. Windows 7 was designed before solid state became the norm, so by default it does a number of things that are either superfluous or potentially damaging to your storage. Windows 8 isn't without its anachronisms in this area, either.

» There are a couple of areas to focus on that'll help to optimize your disk: motherboard spec and BIOS settings are the starting point, followed by tweaks to your operating system. From there you can try to get additional optimization from third-party software. Let's start with the nuts and bolts: getting your mobo and its BIOS to play nice with your drive.

2 CHECK COMPATIBILITY AND DRIVERS

There's an excellent chance your SSD is SATA 3 compatible, which means its SATA port can throw data back and forth at a theoretical 6Gb/s. It's therefore paramount to make sure your motherboard also supports this interface—ideally natively rather than using a third-party controller. It's common in cheaper P67/Z68 chipsets to find only a Marvell SATA 3 port on your mobo, and these really lower your performance ceiling. If you're wondering why you can't replicate the advertised synthetic benchmarks, this is probably the cause. On anything later than Intel's Z68 platform there's a better chance of finding native SATA 3 ports, and boards built around AMD's 9-series chipset regularly feature as many as six. Now the first potential bottleneck is cleared, enter your BIOS and check that you're running the disk in AHCI mode rather than IDE. Of these two standards, only the former enables SATA 3 functionality.

» Now that we're out of the BIOS and into Windows, it's a good idea to check that your chipset drivers are up to date. Most mobo manufacturers will host a page containing links to all the relevant firmware and drivers, and there's a chance the latest driver increases performance.

3 DISABLE UNNECESSARY WINDOWS SETTINGS

Windows does an assortment of background tasks that are unnecessary for SSD owners—scheduling disk defrags, creating system restore points, constantly re-scanning data clusters so it can return search results quicker for you. It's time to turn all that off, and give your drive some peace and quiet.

» Let's start by disabling drive indexing, which does nothing for your SSD's response time, but increases writes. From My Computer, right-click your drive and hit Properties. At the very bottom is a checkbox that says "Allow files on this drive to have contents indexed." Uncheck it (**image A**). Hit Ignore All on the error message and wait a moment for the process to complete.

» While we're in the neighborhood, stay in the Properties window and select the Tools tab, then hit the Defragment Now button. We're not going to actually run a defrag, now or ever; it does nothing to improve performance and thrashes your drive for no reason. Instead, select Defragment Schedule and then uncheck any schedules lurking within (**image B**). That's a load off your SSD's plate.

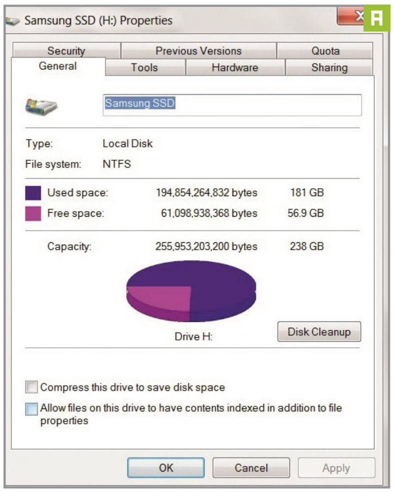
» Next on the chopping block are prefetch and superfetch—processes designed to speed up search results by, yes, constantly thrashing your storage. In the Start search bar, type **regedit**, and when the registry editor opens, find the following file path: HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SessionManager\Memory Management\PrefetchParameters.

» Now, right-click both Superfetch and Prefetch to bring up their modify windows, then change their values to 0 (**image C**). You'll need to do a restart for the changes to take effect. Once that's done, type **services.msc** into the Start search bar, then find both Superfetch and Windows Search and use their drop-down menus to set them to Disabled (**image D**). So long, super-thrasher.

» If you're feeling brave, you can disable the Recycle Bin, which helps the Trim command to do its thing and keeps the maximum possible disk space free. Just don't come crying to us if you delete something important. Right-click the Recycle Bin, then hit Properties, select your SSD and hit "Don't move files to the Recycle Bin" (**image E**).

» With Windows no longer beating your SSD like it's wearing a bow tie on its first day of school, all that's left is to boost your startup time. Type **msconfig** into Start search bar, then in the Boot tab, tick No GUI Boot to disable the Windows graphic and cut seconds off your boot time (**image F**). Untick any unwelcome programs in the Startup tab, too.

» With your BIOS and OS now tailored to your SSD's needs, you have created an environment in which it can perform random-read/write tasks as fast as possible but, crucially, only when those tasks are necessary. It's a win-win: lightning performance when you need it, with the longest possible lifespan. If you want to take it even further, there are options with third-party software, but by getting Windows in order and eliminating the possibility of a hardware bottleneck, you've done your drive a solid.

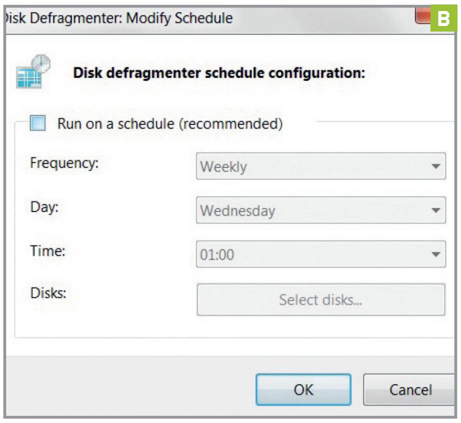

A
Samsung SSD (H:) Properties
Security
Previous Versions
Quota
General
Tools
Hardware
Sharing
Drive H:
Disk Cleanup
OK
Cancel
Apply

Samsung SSD

Type: Local Disk
File system: NTFS

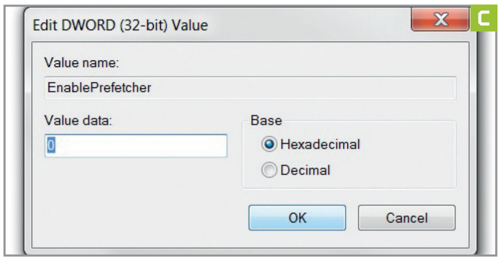
Used space:	194,854,264,832 bytes	181 GB
Free space:	61,098,938,368 bytes	56.9 GB
Capacity:	255,953,203,200 bytes	238 GB

☐ Compress this drive to save disk space
☐ Allow files on this drive to have contents indexed in addition to file properties

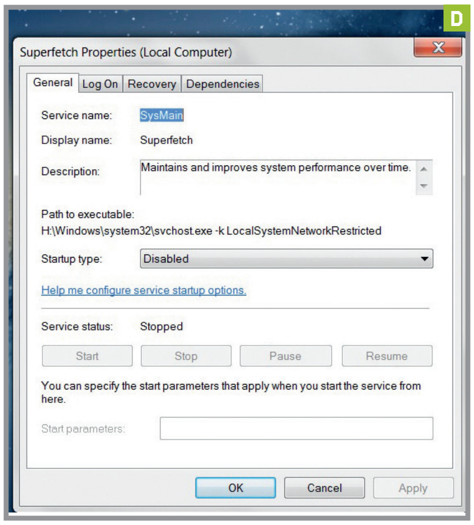

B
isk Defragmenter: Modify Schedule
Disk defragmenter schedule configuration:
Select disks...
OK
Cancel

☐ Run on a schedule (recommended)

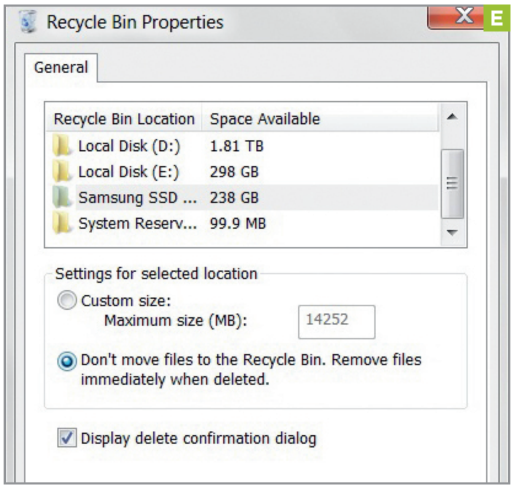
Frequency: Weekly
Day: Wednesday
Time: 01:00
Disks:


C
Edit DWORD (32-bit) Value
Base
OK
Cancel

Value name:
EnablePrefetcher
Value data:
0
● Hexadecimal
○ Decimal

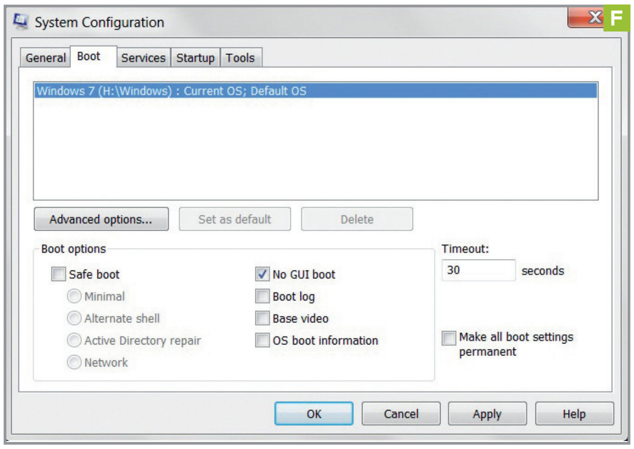

D
Superfetch Properties (Local Computer)
General
Log On
Recovery
Dependencies
Help me configure service startup options.
Start
Stop
Pause
Resume
OK
Cancel
Apply

Service name: SysMain
Display name: Superfetch
Description: Maintains and improves system performance over time.
Path to executable:
H:\Windows\system32\svchost.exe -k LocalSystemNetworkRestricted
Startup type: Disabled
Service status: Stopped
You can specify the start parameters that apply when you start the service from here.
Start parameters:


E
Recycle Bin Properties
General

Recycle Bin Location	Space Available
Local Disk (D:)	1.81 TB
Local Disk (E:)	298 GB
Samsung SSD ...	238 GB
System Reserv...	99.9 MB

Settings for selected location
○ Custom size:
Maximum size (MB): 14252
● Don't move files to the Recycle Bin. Remove files immediately when deleted.
☑ Display delete confirmation dialog


F
System Configuration
General
Boot
Services
Startup
Tools
Advanced options...
Set as default
Delete
OK
Cancel
Apply
Help

Windows 7 (H:\Windows) : Current OS; Default OS

Boot options
☐ Safe boot
○ Minimal
○ Alternate shell
○ Active Directory repair
○ Network
☑ No GUI boot
☐ Boot log
☐ Base video
☐ OS boot information
Timeout: 30 seconds
☐ Make all boot settings permanent

Edit Photos with Gimp

YOU'LL NEED THIS

GIMP
This free, open-source photo-editing suite is available at www.gimp.org.

Even beautiful photographs can often be improved with some subtle editing tweaks. You can spend a small fortune on suitable software, but a free, open-source tool called Gimp includes nearly all the features you'd find in a professional package.

Whether you just want to crop an image or resize it for emailing, Gimp can help you do it quickly and easily. It's also great for boosting color saturation or brightening murky shadow areas, and with a little practice you can even edit out unattractive elements from an image, such as a piece of litter or a facial imperfection.

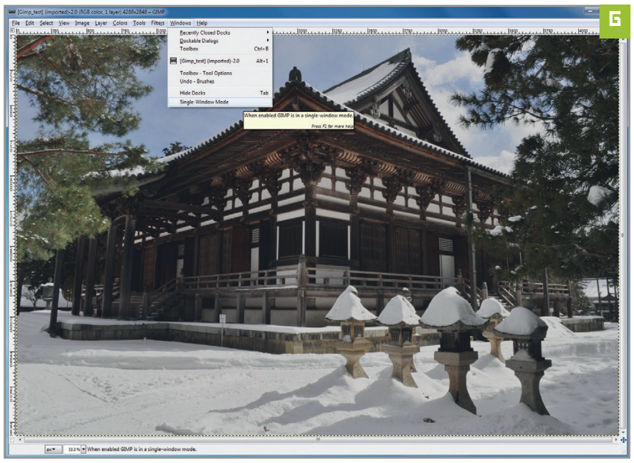
Gimp is packed with useful and fun tools to turn a dull vacation snap into a masterpiece, and while some features can be a little tricky to learn, the results will be worth the effort. It's also easy to use—with our help you won't feel intimidated by a huge array of options and complicated tools. So, without further ado, let's get editing! –**BEN ANDREWS**

1 CORRECTING VERTICALS AND CROPPING First, we like to customize Gimp's tool palettes to suit our working style. By default, these float in separate Windows, but to combine them with the image window, click the Windows tab on the top toolbar and select Single-Window Mode. Open your photo via the usual File > Open procedure and hit Ctrl + Shift + J to automatically zoom the image preview to fill the window space (**image G**).

» See those leaning wooden pillars on the left of the building? Let's correct these converging verticals by first creating some vertical reference lines. Click anywhere on the ruler located to the left of the image and drag it right, dropping a line roughly two inches from the right edge of the image. Now, drag a second line and drop it among the wooden pillars on the left.

» Press Shift + P to activate the Perspective tool (**image H**). Ensure the Clipping option on the left is set to Adjust, then click-and-drag the lower-left corner of the image directly to the right until the leaning pillars stand parallel with the left-hand reference line. Drag the bottom-right corner roughly the same distance to the left, then click the Transform button in the small pop-up window.

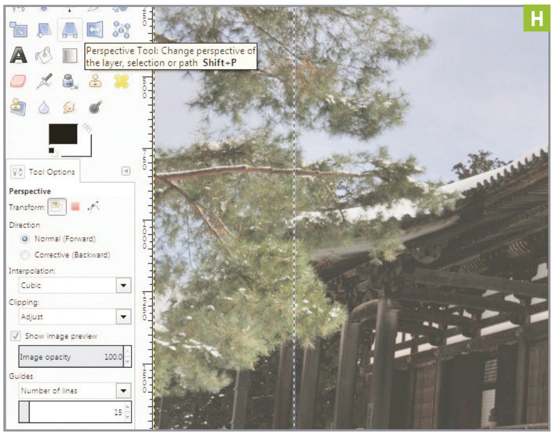
» To restore the rectangular framing, switch to the cropping tool by pressing Shift + C, then click the bottom-left corner of the image and drag up to the top-right to make a box that includes as much of the photo as possible while still excluding the diagonal edges (**image I**). Double-click inside the box to apply the crop, then resize the image preview again by clicking Ctrl + Shift + J.


G

[Gimp_test] (imported)-2.0 (RGB color, 1 layer) 4288x2848 – GIMP

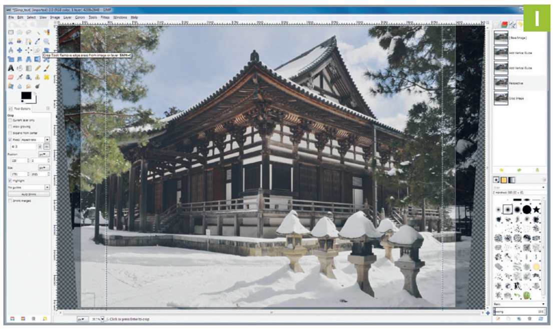
When enabled GIMP is in a single-window mode.

Press F1 for more help


H

Perspective Tool: Change perspective of the layer, selection or path **Shift+P**

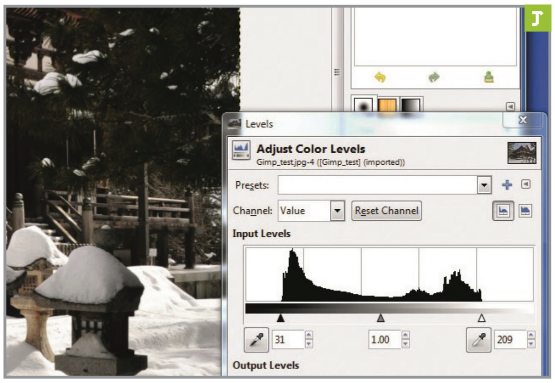
Perspective
Direction: ● Normal (Forward)
Interpolation: Cubic
Clipping: Adjust
☑ Show image preview
Image opacity 100.0
Guides: Number of lines
15


I

2 COLOR ADJUSTMENTS Landscape photos can often look hazy, with dull color saturation. We'll address this by clicking the Colors tab and selecting Levels. Notice the black-and-white Input Levels histogram graph and the three small triangle markers directly beneath it? Drag the left and right triangles so they line up with their respective ends of the black graph shape (**image J**), then click OK.

» Next, those dark shadows need brightening up. Back on the Colors tab, opt for Curves. Click roughly a quarter up the long diagonal line and drag it straight up approximately two squares of the background grid. Now, click the same distance from the other end of our curve and drag back down to the original straight line (**image K**), restoring the highlight areas to their previous brightness.

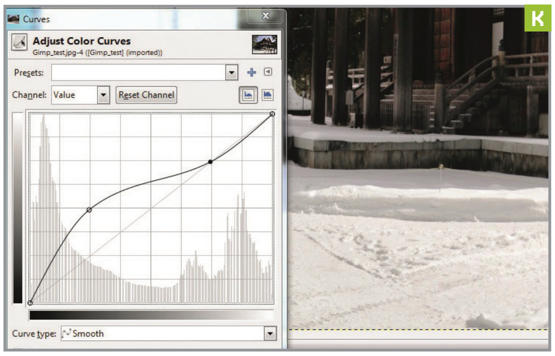
» Now we're getting somewhere! However, the area of blue sky is still slightly dull. You can increase the saturation of this specific area by clicking the Colors tab again and selecting Hue-Saturation from the menu. In the new window, choose the blue color (not cyan) and slide the bottom Saturation slider all the way to the right (**image L**). Click OK to apply the changes.


J

Levels
Adjust Color Levels
Gimp_test.jpg-4 ([Gimp_test] (imported))
Presets:
Reset Channel
Input Levels
Output Levels

Channel: Value

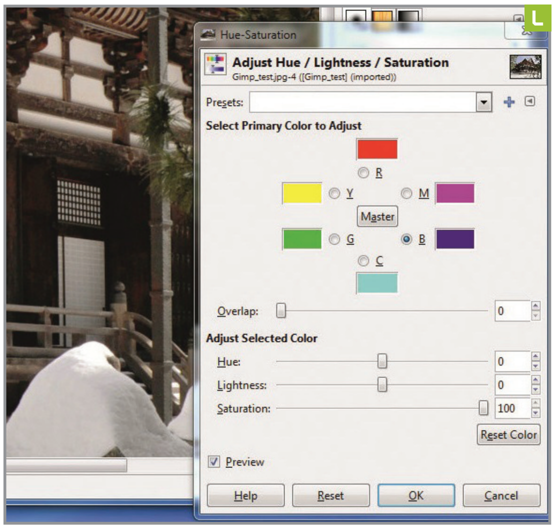
Input Levels: 31 1.00 209


K

Curves
Adjust Color Curves
Gimp_test.jpg-4 ([Gimp_test] (imported))
Presets:
Reset Channel

Channel: Value

Curve type: Smooth


L

Hue-Saturation
Adjust Hue / Lightness / Saturation
Gimp_test.jpg-4 ([Gimp_test] (imported))
Presets:
Select Primary Color to Adjust
R
Y
M
Master
G
B
C
Adjust Selected Color
Reset Color
Help
Reset
OK
Cancel

○ R ○ Y ○ M ○ G ● B ○ C

Overlap: 0

Hue: 0

Lightness: 0

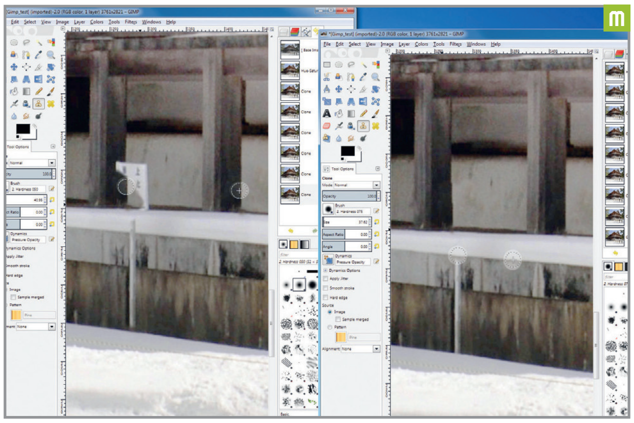
Saturation: 100

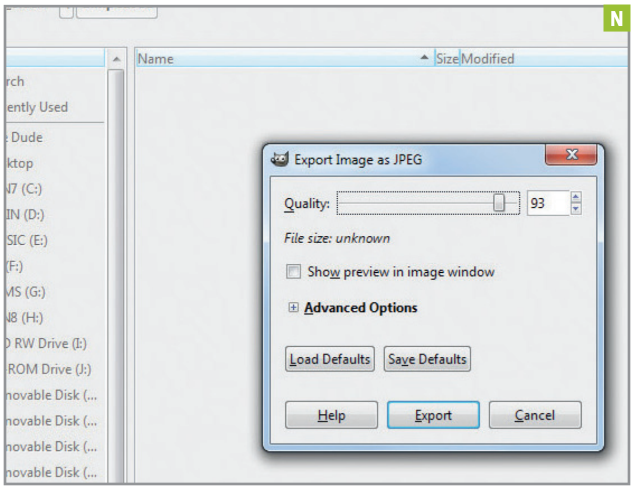
☑ Preview

3 ADVANCED EDITING Let's try digitally uprooting that small sign in front of the building. Press C to switch to the Clone Stamp tool, then tap 2 to zoom in to 200 percent for a better view. Find the sign by holding down Space and clicking-and-dragging the image. Position the cursor so the dotted circle is centered on the bottom-right corner of the wooden pillar, just to the right of the sign.

» Press and hold Ctrl, click once, release Ctrl, and align the cursor as best you can in the equivalent position over the pillar behind the sign. Click, drag, and paint over the sign (**image M**). To remove the sign's pole, find a new reference point that's about an inch to the left or right of the pole and again press Ctrl and click. Move your mouse to the matching position on the pole and paint it out.

» To save your completed image, ignore the obvious Save option on the File tab and instead select Export. Name your file something different from the original, click Export, and ensure the Quality slider is set to 90 or higher (**image N**). Finally, click Export again to complete the save. Now you can sit back, flick between the original and edited images, and admire what you've achieved! ⏻


M


N

Name
Size
Modified
rch
ently Used
Dude
ktop
N7 (C:)
IN (D:)
SIC (E:)
(F:)
MS (G:)
N8 (H:)
RW Drive (I:)
ROM Drive (J:)
novable Disk (...
novable Disk (...
novable Disk (...
novable Disk (...
Export Image as JPEG
Advanced Options
Load Defaults
Save Defaults
Help
Export
Cancel

Quality: 93

File size: unknown

☐ Show preview in image window

BUILD IT

TOM MCNAMARA **ASSOCIATE EDITOR**

Installing SteamOS on Your PC

There's no need to wait for companies to start selling pre-built Steam Machines when you can put SteamOS on your PC today—follow along as we load it onto last month's Build It rig

LENGTH OF TIME: **1–2 HOURS**

LEVEL OF DIFFICULTY: **MEDIUM**

THE MISSION If you're a PC gamer, you probably noticed that Valve Software and Microsoft aren't BFFs these days. Valve uses its own Steam software client to deliver thousands of games to PC gamers around the world, and it is probably concerned that at some point Microsoft is going to want a piece of the action, just like how Apple takes a percentage for each sale via iTunes. Valve is apparently so concerned with the direction it thinks Microsoft is headed that it's gone to the trouble of building an entirely new operating system just for its Steam client, and dubbed it SteamOS. It's a Linux distribution, so it's a free alternative to Windows, and it's designed to run on pre-built Steam Machines, which are console-size and due this year. However, it will run on any current PC, so we figured we'd take it for a spin this month to see how it feels. We did it because, aside from the joy of tinkering, SteamOS runs a surprisingly large number of games, and one day it will be able to stream games to your TV from a computer. To satisfy our curiosity, we decided to install the SteamOS on a DIY machine we had in the Lab.

COOLER MASTER

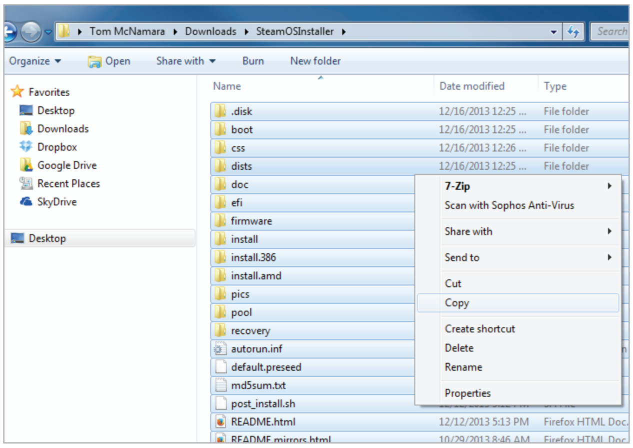
LAYING PIPE

WE WERE NOT among the 300 lucky SOBs who scored a Steam Machine direct from Valve for beta testing, so we installed SteamOS on a machine we created in last month's Build It. SteamOS only runs on Nvidia video cards at press time, though, so we swapped the system's AMD Radeon R9 290X for a GeForce GTX 780. Since this Build It is focused on software rather than hardware, we'll skip the usual components chart and just give you a quick rundown right here. Our box has an Intel Core-i7-4770K, 16GB of DDR3 RAM, a "gold"-rated 550W Seasonic power supply with modular cables, and a 256GB SSD and 1TB Black. SteamOS requires a motherboard that uses UEFI and a 64-bit CPU. Valve recommends at least 4GB of RAM and 500GB of storage space. Some familiarity with Linux is also helpful, but it's not required. To install SteamOS, we'll also need a USB flash drive, preferably 4GB or larger. And this is very important: Just like with Windows, whatever drive you install SteamOS to will be formatted during the installation, so if you are looking to dual-boot you will want to keep that OS on a different partition or drive altogether. In fact, we recommend disconnecting the device with Windows on it while installing SteamOS, just to be safe. Also, the build of SteamOS that we used does not have a complete audio package. The only way to get sound is over an HDMI cable, either to a receiver or a flat-panel display with integrated speakers.

2

EXTRACTION BEGINS

WINDOWS HAS built-in ZIP file extraction these days, so you can just double-click on the freshly downloaded file to view its contents, hit Ctrl + A to select everything, Ctrl + C to copy it all, then double-click your flash drive in Windows Explorer, and press Ctrl + V to begin the transfer. It's a large file, so that could take 15 minutes to half an hour, depending on the speed of your CPU and whether you're using USB 3.0 or 2.0. While the files are being extracted and copied over, we recommend digging up your motherboard manual or looking online to find out which button to press on boot to access a Boot Selection menu so that you can boot from the USB key. It's usually F12, but varies by mobo. Also, we recommend installing Steam to a mechanical hard drive as SSD optimization in Linux can get complicated if you're not familiar with the OS. If you want to take a stab at it though, here's the official guide: http://bit.ly/1aralb1.

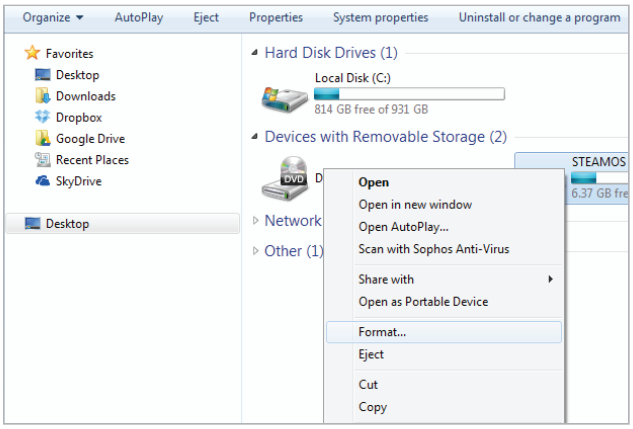

Tom McNamara ▸ Downloads ▸ SteamOSInstaller ▸
Search
Organize
Open
Share with
Burn
New folder
Favorites
Desktop
Downloads
Dropbox
Google Drive
Recent Places
SkyDrive
Desktop
7-Zip
Scan with Sophos Anti-Virus
Share with
Send to
Cut
Copy
Create shortcut
Delete
Rename
Properties

Name	Date modified	Type
.disk	12/16/2013 12:25 ...	File folder
boot	12/16/2013 12:25 ...	File folder
css	12/16/2013 12:26 ...	File folder
dists	12/16/2013 12:25 ...	File folder
doc		
efi		
firmware		
install		
install.386		
install.amd		
pics		
pool		
recovery		
autorun.inf		
default.preseed		
md5sum.txt		
post_install.sh		
README.html	12/12/2013 5:13 PM	Firefox HTML Doc.
README.mirrors.html	10/29/2013 8:46 AM	Firefox HTML Doc.

1

DOWNLOADING THE PACKAGE

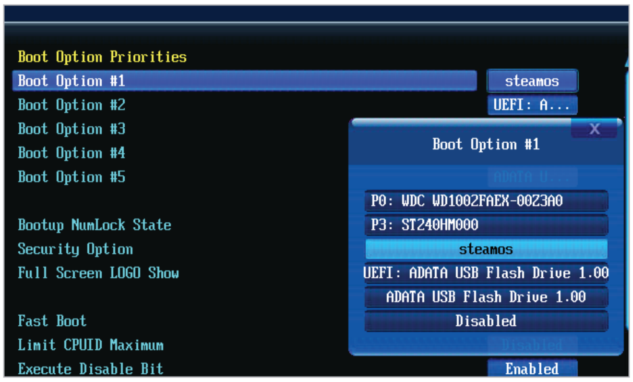
DOWNLOAD THE 950MB installer package from Valve's servers at http://repo.steampowered.com/download. There are torrents floating around, but none are officially approved. The SteamOS installer download is a ZIP file instead of the ISO that you'd usually use to install an operating system. You can create an ISO from this package and burn it to disc, but a lot of people (including ourselves) experience difficulty doing this, so we instead extracted the files to a USB key. Be sure to back up any important data on your flash drive, because you'll need to format it as FAT32 for the installation (most USB keys default to this file type during formatting). Just open Windows Explorer, right-click your flash drive's icon, select Format, make sure the file system is set to FAT32, and click the button labeled Start. When the installer is done downloading, extract it to the USB stick.


Organize
AutoPlay
Eject
Properties
System properties
Uninstall or change a program
Favorites
Desktop
Downloads
Dropbox
Google Drive
Recent Places
SkyDrive
Desktop
Hard Disk Drives (1)
Local Disk (C:)
814 GB free of 931 GB
Devices with Removable Storage (2)
STEAMOS
6.37 GB fre
Network
Other (1)
Open
Open in new window
Open AutoPlay...
Scan with Sophos Anti-Virus
Share with
Open as Portable Device
Format...
Eject
Cut
Copy

3

BEGIN THE INSTALL

THE ACTUAL INSTALLATION of SteamOS is pretty easy, since it's almost entirely automated. Just shut down your system, detach your Windows drive, plug in the USB key with SteamOS on it, start your PC again, and press your motherboard's preferred key for accessing the boot menu. This should list your flash drive with a "UEFI" tag at the front. Choose that, select Automated Install from the next menu, and go grab a bite to eat because it will take about 30 minutes to install on a mechanical hard drive.

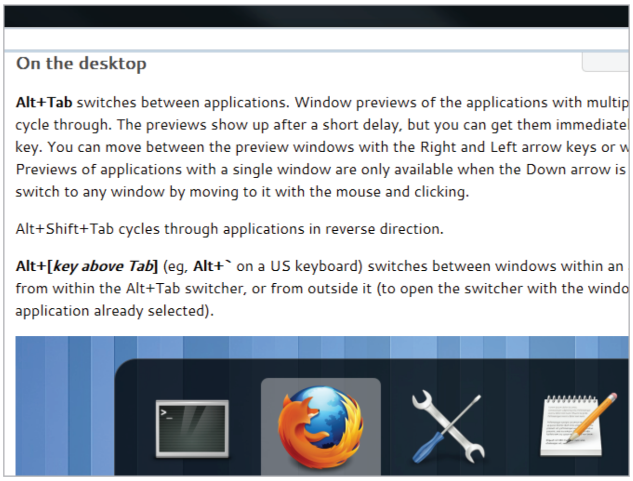


```
Boot Option Priorities
Boot Option #1              steamos
Boot Option #2              UEFI: A...
Boot Option #3
Boot Option #4
Boot Option #5

Bootup NumLock State
Security Option
Full Screen LOGO Show

Fast Boot
Limit CPUID Maximum
Execute Disable Bit         Enabled
```

Boot Option #1
X
P0: WDC WD1002FAEX-00Z3A0
P3: ST240HM000
steamos
UEFI: ADATA USB Flash Drive 1.00
ADATA USB Flash Drive 1.00
Disabled

4 GET TO KNOW LINUX

WHILE THE OS is installing we'd recommend taking some "me time" to check out some basic Linux commands and concepts, if you're not already familiar with them. SteamOS is a variant of Debian (version 7, code-name "Wheezy"), so Googling the latter will give you info on the former. SteamOS also uses the Gnome Shell for its desktop environment, and that comes with a set of keyboard shortcuts that are handy to have at your fingertips. The makers of Gnome keep a cheat sheet here: http://bit.ly/1grDW8V. Most of them will be familiar to Windows veterans.



On the desktop

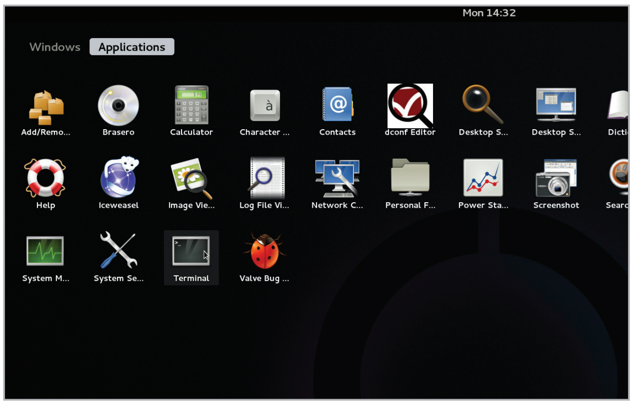
Alt+Tab switches between applications. Window previews of the applications with multip
cycle through. The previews show up after a short delay, but you can get them immediatel
key. You can move between the preview windows with the Right and Left arrow keys or w
Previews of applications with a single window are only available when the Down arrow is
switch to any window by moving to it with the mouse and clicking.

Alt+Shift+Tab cycles through applications in reverse direction.

Alt+[*key above Tab*] (eg, **Alt+`** on a US keyboard) switches between windows within an
from within the Alt+Tab switcher, or from outside it (to open the switcher with the windo
application already selected).

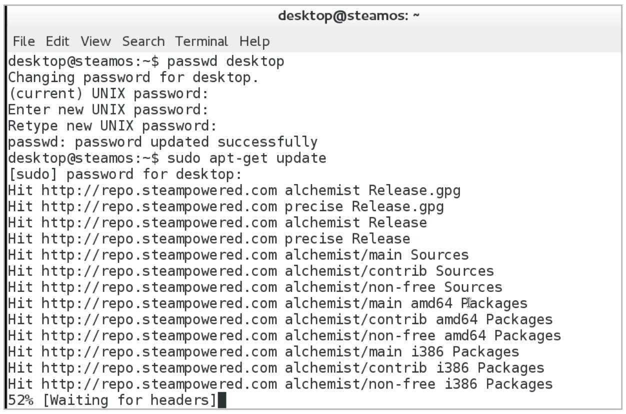
5 YOU HAVE ARRIVED

ONCE STEAMOS has installed, it will prompt you to reboot your PC. At the login screen, the user name is **steam**, and the password is **steam**. You can change this later. Note the drop-down menu right below the password field. Selecting SteamOS will launch you directly into Steam's Big Picture mode, which uses an interface designed for living room TVs set about 10 feet away from the user. Default Xsession will give you the Gnome Shell desktop instead. We're not sure if this menu will even be accessible once SteamOS is out of its beta phase, but you should take a look at Gnome, now that it's actually on your computer. The first order of business is to finish the install, via the command-line terminal. Select Activities in the upper left-hand corner of the screen, choose Applications, and click Terminal. Type **su desktop**, use **desktop** as your password, type **./post_logon.sh**, and hit the Y key to confirm a series of automated steps. You can also open the terminal by pressing Alt-F2, typing **gnome-terminal** and hitting Enter. Alt-F2 is basically like Windows's Run dialog.



6 OPENING THE VALVE

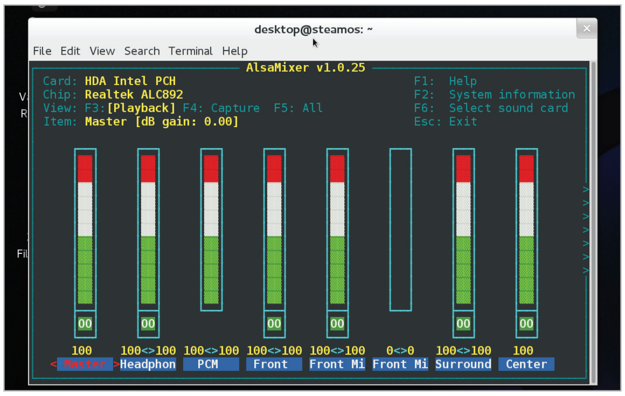
ONCE THE post-install script has completed, reboot the system, and you will be launched directly into Steam's Big Picture mode. To get back to the desktop, click the Exit button and select "Return to Desktop." The screen will go dark for a few seconds, and you'll be back in the Gnome Shell. There will be an icon on the desktop that you can click to return to Big Picture mode. At this stage, you may need to re-create your account password to correctly establish admin privileges. In a terminal window, type **passwd desktop**, and type in whatever new password you desire. That will allow you to use "sudo" commands, which temporarily give you administrator privileges for things like installing software or accessing system-wide settings.



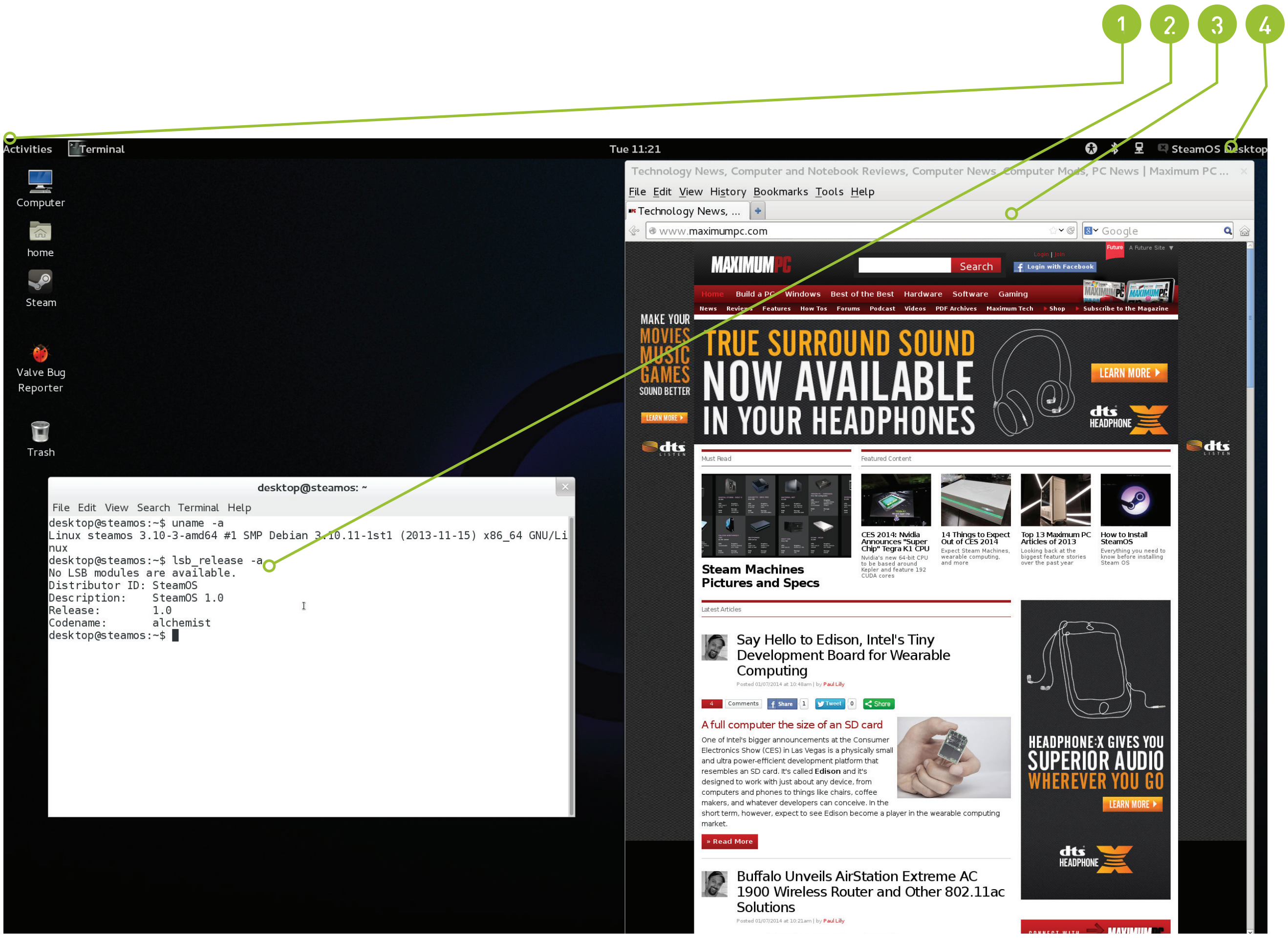
```
desktop@steamos:~$ passwd desktop
Changing password for desktop.
(current) UNIX password:
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
desktop@steamos:~$ sudo apt-get update
[sudo] password for desktop:
Hit http://repo.steampowered.com alchemist Release.gpg
Hit http://repo.steampowered.com precise Release.gpg
Hit http://repo.steampowered.com alchemist Release
Hit http://repo.steampowered.com precise Release
Hit http://repo.steampowered.com alchemist/main Sources
Hit http://repo.steampowered.com alchemist/contrib Sources
Hit http://repo.steampowered.com alchemist/non-free Sources
Hit http://repo.steampowered.com alchemist/main amd64 Packages
Hit http://repo.steampowered.com alchemist/contrib amd64 Packages
Hit http://repo.steampowered.com alchemist/non-free amd64 Packages
Hit http://repo.steampowered.com alchemist/main i386 Packages
Hit http://repo.steampowered.com alchemist/contrib i386 Packages
Hit http://repo.steampowered.com alchemist/non-free i386 Packages
52% [Waiting for headers]
```

7 HISSING NOISES

YOU MAY HAVE issues getting audio to work. At press time, there was a bug that muted several outputs, and the built-in audio panel did not display those outputs. As a work-around, we had to manually install a third-party panel that shows everything. ALSA Mixer is one such program, but we want the one specifically built for Debian. To get that, go to desktop mode, open the Applications menu, select Iceweasel, and go to this address: http://packages.debian.org/wheezy/alsa-utils. Scroll down to the bottom, click AMD64, and choose your download location. Once that's finished, open the terminal and type **cd Downloads**. Then type **sudo dpkg -i alsa-utils_1.0.25-4_amd64.deb**. Now type **alsamixer** in the terminal to bring up the new audio panel. Use the F6 key to cycle through your available audio outputs. Arrow keys cycle through each audio channel, and M toggles the mute. If that doesn't work, you should at least be able to get audio over HDMI, either through integrated TV speakers or a home theater receiver.



```
AlsaMixer v1.0.25
Card: HDA Intel PCH                                F1:  Help
Chip: Realtek ALC892                               F2:  System information
View: F3:[Playback] F4: Capture  F5: All           F6:  Select sound card
Item: Master [dB gain: 0.00]                       Esc: Exit

   00       00                00       00                00       00

  100    100<>100 100<>100 100<>100 100<>100   0<>0   100<>100   100
< Master >Headphon   PCM     Front   Front Mi Front Mi Surround  Center
```


1
2
3
4
Activities
Terminal
Tue 11:21
SteamOS Desktop
Computer
home
Steam
Valve Bug Reporter
Trash
desktop@steamos: ~
File Edit View Search Terminal Help
Technology News, Computer and Notebook Reviews, Computer News, Computer Mods, PC News | Maximum PC ...
File Edit View History Bookmarks Tools Help
Technology News, ...
www.maximumpc.com
Google
MAXIMUM PC
Search
TRUE SURROUND SOUND NOW AVAILABLE IN YOUR HEADPHONES
LEARN MORE
Steam Machines Pictures and Specs
Say Hello to Edison, Intel's Tiny Development Board for Wearable Computing
A full computer the size of an SD card
Buffalo Unveils AirStation Extreme AC 1900 Wireless Router and Other 802.11ac Solutions
HEADPHONE:X GIVES YOU SUPERIOR AUDIO WHEREVER YOU GO

```
desktop@steamos:~$ uname -a
Linux steamos 3.10-3-amd64 #1 SMP Debian 3.10.11-1st1 (2013-11-15) x86_64 GNU/Li
nux
desktop@steamos:~$ lsb_release -a
No LSB modules are available.
Distributor ID: SteamOS
Description:    SteamOS 1.0
Release:        1.0
Codename:       alchemist
desktop@steamos:~$ █
```

1. The Activities menu in the upper left is a hot corner (opens when you hover your mouse over it) that shows you both running apps and installed apps.

2. The available commands for the Linux terminal are so extensive that many power users don't even have a desktop environment.

3. The Iceweasel Internet browser bundled in SteamOS is too outdated for day-to-day use; we recommend using the Steam client's own browser.

4. To shut down, you need to click the upper right-hand menu and press the Alt key.

GETTING ON THE TRAIN

ONCE WE HAD SteamOS up and running, the first order of business was seeing what applications were available in the package and from the repositories, or "repos." Unfortunately, it's pretty bare-bones. There's no word processor, image editor, email client, or media player, for example. With Debian, this is usually not a big deal, since it has literally thousands of packages in its repos that are just a few clicks away from installation. But SteamOS doesn't point to Debian's servers, and there's no way to force it to. And they're two different distributions anyway, so you could get hit with incompatibilities and errors even if you could. Therefore, SteamOS, or at least this version of it, does not look like it's meant to replace Windows. It's a stripped-down gaming platform. You can always install packages on your own, or build from source, but that's not nearly as much fun.

With nearly 100 of our 289 Steam games compatible with Linux, however, including nearly all of Valve's titles (though Counter-Strike: Global Offensive is a prominent exception), it's a pretty good gaming platform. Metro: Last Light is also getting bundled with retail Steam Machines, and a quick scan of our personal library also included popular titles like Starbound, Bastion, Mark of the Ninja, Fez, Football Manager 2014, and Monaco. DOTA 2, one of the most popular games in the world, will also be available on SteamOS. Unfortunately for AMD users, SteamOS uses Nvidia's proprietary drivers, so you can't run an AMD GPU at this time.

We also dual-booted with Windows, which was simple since our test bench had Windows installed on the SSD and SteamOS on the hard drive. We just selected our boot device during startup and were back in Windows-ville. You can also go into the board's BIOS and tell it to boot to a specific drive every time, instead of manually selecting from the boot menu. It's not as clean as getting the Linux boot loader to just "see" Windows and add it to its own boot menu, but it's close enough for our needs.

Overall, we're not sure at this time if running SteamOS is worth the effort, since you can get Steam for Ubuntu and other Linux distros, where you'll get access to repos and the ability to dual-boot. It's fun to play with though, so if you have a spare drive and some time you should check it out. If you're on Windows though, don't worry—you're not missing anything. ⏻

REVIEWS

TESTED. REVIEWED. VERDICTIZED.

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LG
Blu-ray Disc
M-DISC
BD Rewriter
AVA
CUSTOM COMPUTERS

AVADIRECT MINI GAMING PC
PAGE 72

PSU
PSU
PSU
DirectCU II

Though capable and reasonably priced, this medium form factor is eclipsed by smaller, faster, and cheaper machines.

AVADirect Mini Cube Gaming PC

Just call it 'The Fridge'

NAMING A PC isn't an easy task. It's hard enough when you're talking about your personal PC (Betsy, Svetlana, or Jabba work well), but when you're a company selling a new model, Marketing 101 says the name should imbue magic and convince consumers to pony up.

We're guessing AVADirect didn't take that class, as its new custom mini-cube gaming PC is apparently named Mini Cube Gaming PC. The truth is, AVADirect probably doesn't give a damn about the name because frankly, who cares? Maybe "5S" or "S IV" works on some people, but on a custom PC where you pick out the parts yourself, it's probably far less pressing.

Around the office, we've taken to calling this handsome SFF machine "The Fridge," not necessarily because of its size, but because of its Frigidaire-like aesthetic. Sure, it would have been cool if the optical drive shared the same brushed-aluminum surface, but it still matches the black accents elsewhere on the case. While there's no question that this is a small form factor rig, compared to the micro-towers we've seen lately, it's pretty big. It's more than double the width of the Falcon Northwest Tiki, and while slightly shorter than the CyberPower Hadron we reviewed in February, it's about three inches wider than that machine.

That size increase gives it more capability. While most micro-towers use SFX or 1U PSUs, The Fridge uses a standard 760W Seasonic ATX PSU. Inside, you'll also find a liquid-cooled Core i7-4770K overclocked to 4.2GHz, 16GB of Kingston DDR3/1600, two Kingston 120GB HyperX SSDs in RAID 0, a 2TB WD HDD, an MSI Z87 Mini-ITX board, and an Asus GeForce GTX 780 card.

Against our zero-point system, the AVADirect represents well in the non-heavily multithreaded tasks but, not surprisingly, it gets left behind in all other tests by the ZP's six-core Core i7-3930K part clicking along at 3.8GHz. That includes gaming tests, but not by the margin you would expect from the zero-point's GeForce GTX 690.

The more important question is how The Fridge compares with the SFF/micro-tower crowd. Not too shabby. The bad mutha of the group continues to be Falcon Northwest's Tiki, with its Haswell part overclocked to 4.7GHz and a GeForce Titan. Indeed, the Tiki still stands as the fastest micro-tower we've ever tested, and the fact that it's held onto that title well into the new year demonstrates how aggressively Falcon went for broke with this model. Of course, that aggression comes at a price, with the Tiki hitting the $4,400 mark. At $2,583, AVADirect can pull the old, "You can buy our system, play all of your games, and still have enough money to buy two of the upcoming cheap 4K panels" routine.

Normally, that routine would sway us, because like most folks, we can see sacrificing a little performance for a new monitor, keyboard, mouse, and new suit and shoes, too. But then there's CyberPower PC's Hadron Hydro 300, which costs $300 less than the AVADirect. It almost mirrors the parts in the AVADirect except for the HDD. The Hadron also packs custom liquid-cooling for its CPU and GPU, which, while the chassis gets a tad warm, helps the rig run extremely quietly and gives it a slight performance edge. The AVADirect box is louder and under heavy loads emits a low-frequency large-fan buzz.

That leaves the AVADirect in a tough spot. It's slower than the Tiki and more expensive than the Hadron. Yes, it's got an off-the-shelf PSU, but we're not sure that's worth the sacrifice in size. Yes, it's a striking-looking case with its brushed-steel/aluminum finish, but maybe the sun is just finally starting to set on the medium form factor. **–GORDON MAH UNG**

VERDICT 7

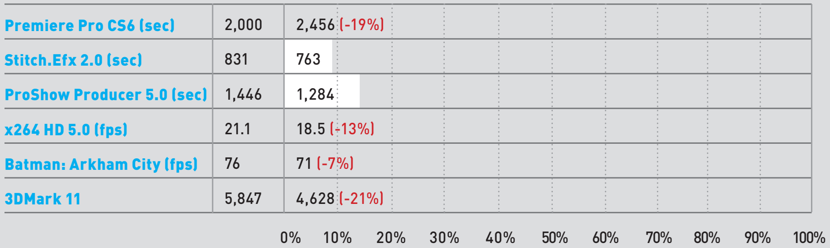
AVADirect Mini Cube Gaming PC

➕ **THERMAFLU** Brushed-steel look; full-size optical drive; moderate cost.

➖ **THERMAL DETONATOR** Not as fast nor as quiet as smaller machines.

$2,584, www.avadirect.com

BENCHMARKS



	ZERO POINT	
Premiere Pro CS6 (sec)	2,000	2,456 (-19%)
Stitch.Efx 2.0 (sec)	831	763
ProShow Producer 5.0 (sec)	1,446	1,284
x264 HD 5.0 (fps)	21.1	18.5 (-13%)
Batman: Arkham City (fps)	76	71 (-7%)
3DMark 11	5,847	4,628 (-21%)

Our current desktop test bed consists of a hexa-core 3.2GHz Core i7-3930K 3.8GHz, 8GB of Corsair DDR3/1600, on an Asus Sabertooth X79 motherboard. We are running a GeForce GTX 690, an OCZ Vertex 3 SSD, and 64-bit Windows 7 Professional.

SPECIFICATIONS

Processor	Core i7-4770K @ 4.2GHz
Mobo	MSI Z87I
RAM	16GB Kingston HyperX Beast DDR3/1600
Graphics	Asus GeForce GTX 780
Storage	2x Kingston 120GB HyperX in RAID 0, 2TB Western Digital Black
Optical	LG BH16NS40
Case/PSU	Lian Li PC-Q28B / 760 watt Seasonic Platinum

The Tri-X throws off AMD's meh cooler.

Tri-X
TRIPLE FAN

Sapphire Tri-X Radeon R9 290X

A real gem of a GPU

FOR THOSE WHO haven't kept up with current events: Late last year AMD launched its all-new Hawaii GPUs, starting with its flagship Radeon R9 290X that featured a blower-type cooler designed by AMD. In testing, it ran hotter than any GPU we've ever tested, hitting 94 C at full load, which is about 20 C higher than normal. AMD assured everyone this was *no problemo*, and that the board was designed to run those temps until the meerkats came home. It was stable at 94 C, but the GPU throttled performance at those temps. The stock fan was also a bit loud at max revs, so though the card offered kick-ass performance, it was clearly being held back by the reference cooler.

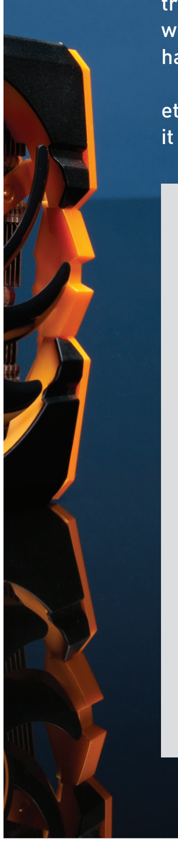
Therefore, we all eagerly awaited the arrival of cards with aftermarket coolers, and this month we received the first aftermarket Radeon R9 290X—the massive triple-fan Tri-X model from Sapphire; and we must say, all of our Radeon prayers have been answered by this card.

Not only does it run totally cool and quiet at all times, but because it runs so chilly it has plenty of room to overclock, making it a card that addresses every single one of our complaints about the reference design from AMD. There is one caveat: price. The Sapphire card is $50 more expensive than the reference card at $600, but you are obviously getting quite a bit of additional horsepower for your ducats.

Compared to the reference card, the Sapphire board is one-half inch longer, so it's a lengthy 12 inches, making it the longest GPU we have in the Lab currently. The PCB design is the same as a reference board, so nothing has changed on that front, making the only significant difference the cooler. The clock speeds have increased a bit on this model, with a maximum of 1,040MHz compared to 1,000MHz on the reference card (which was actually in the low 900MHz range typically). Sapphire also boosted the memory speed a tiny bit to 5,200MHz, which is 200MHz faster overall than the reference board. Otherwise it has the same 4GB of memory, the same 6-pin and 8-pin power connectors, and the same overall TDP of around 300 watts or so.

When we first fired it up, we were amazed to see it hit 1,040MHz under load, and stay there throughout testing. Even more surprising were the temps we were seeing. Since the reference card hits 94 C all day long, this is obviously a really hot GPU, but the Sapphire Tri-X cooler was holding it down at a chilly 75 C. The card was whisper-quiet too, which was also a pleasant surprise given the noise level of the reference cooler. We were also able to overclock it to 1,113MHz, which is a turnaround in that we could not overclock the reference board at all since it throttles at stock settings.

So, we know the card is quiet, runs cool, and can overclock, but the real question is whether or not it's worth the extra $50 over the reference card. To that question, our answer is a resounding yes in all caps along with a smiley emoticon for those who can't understand emotion anymore. In our tests it was not only much faster than the reference card due to its overall higher clock speed (thanks to superior cooling), but it's so quiet and cool that it's much easier to live with, and you can overclock it to achieve even greater performance gains. Whether or not it's worth an extra $100 over a GTX 780 is a more difficult question, but the Sapphire Tri-X R9 290X is the best AMD card we have ever tested. We're taking off one point though, because most of the Nvidia add-in board vendors charge only $10 or $20 more than a reference card for extravagant cooling, so $50 seems like a bit much. **–JOSH NOREM**



SPECIFICATIONS

	Sapphire Tri-X Radeon R9 290X	AMD Radeon R9 290X Reference	Gigabyte GeForce GTX 780 GHz
Driver	13.12	13.12	331.82
3DMark Fire Strike	**9,820**	9,737	9,695
Unigine Heaven 4.0 (fps)	33	32	**39**
Unigine Valley 1.0 (fps)	40	36	**47**
Call of Duty: Ghosts (fps)	44	47	**53**
Crysis 3 (fps)	**30**	28	**30**
Far Cry 3 (fps)	39	31	**44**
Tomb Raider (fps)	26	**27**	25
Metro: Last Light (fps)	**26**	17	25
Battlefield 4 (fps)	46	45	**47**
Batman: Arkham Origins (fps)	46	**51**	**51**
Assassin's Creed: Black Flag (fps)	30	30	30

Best scores are bolded. Our test bed is a 3.33GHz Core i7 3960X Extreme Edition in an Asus Rampage IV Extreme motherboard with 16GB of DDR3/1600 and a Thermaltake ToughPower 1,050W PSU. The OS is 64-bit Windows 8. All games are run at 2560x1600 with 4x AA except for the 3DMark tests.

VERDICT
9
KICK ASS!

Sapphire Tri-X Radeon R9 290X

➕ **THREE Xs** Runs cool; very quiet; overclocks well.

➖ **ONE R** A bit pricey compared to reference.

$600, www.sapphiretech.com

This bad boy boosted
to almost 1,200MHz
right out of the box.

Gigabyte GeForce GTX 780 GHz Edition

Ready to put the Hert(z) on AMD

IT CAN GET a bit confusing in the video card world, what with the similar names for all the cards and the subtle differences among models. Things just got more confusing this month with the release of the Gigabyte GTX 780 GHz Edition, which was a special designation previously used for AMD cards. Since AMD has abandoned the GHz tag, however, Gigabyte figured it would adopt it and attach it to a superclocked version of the venerable GTX 780. Whereas the standard GTX 780 comes with a base clock of just 863MHz and a boost clock of 900MHz, the GHz edition comes with a base clock of—can you guess?—1,019MHz and a boost clock of 1,071MHz. That's quite an overclock right out of the box, and to achieve it Gigabyte has deployed its highly effective WindForce triple-fan cooling solution. We've seen this cooler before on the company's higher-spec'd GTX 780 Ti, so we know it allows for silent operation and impressive overclocking. The GTX 780 is in the middle of a price war with AMD's new R9 GPUs, so it has to keep costs down in order to remain competitive. The R9 290 is generally faster than the GTX 780 in stock trim, so the GHz edition is a response to that card, but since it's priced at $540 it's primed to take on the R9 290X, as well.

Compared to the stock GTX 780, the GHz edition has the aforementioned higher clocks as well as a fully custom PCB that includes an eight-phase power design for more stable overclocking. It also features two 8-pin power connectors instead of a 6-pin and an 8-pin, which helps it achieve those higher clocks and remain stable at higher frequencies. Finally, it features a metal back-and-side plate that wraps around the card on all sides, which isn't something we've seen before on an aftermarket card. The GHz edition card is one-half inch longer than the stock card at 11 inches, and costs about $40 more than the reference design.

For our testing, we compared the card to a stock GTX 780 as well as the king of GTX 780s—the EVGA GTX 780 ACX, which received a perfect 10/Kick Ass verdict in our October issue. We also tossed it in the ring with a stock AMD Radeon R9 290 and an R9 290X, since they are all in the same GPU ballpark. When compared to the Radeon cards, the GHz edition board ate their lunch, which is a turnaround from what we've seen before, where the cards were neck-and-neck in testing. The GTX 780 GHz even beat the more expensive Radeon R9 290X in seven out of 11 of our tests, and simply crushed the Radeon R9 290 in all but two tests. Since the Radeon cards are hard to find and priced accordingly, the regular 290 is now more than $500, so choosing between it and the 780 GHz edition is a no-brainer, as the 780 wins every time. Choosing between the Gigabyte card and the EVGA card is more difficult though, as the EVGA card is about $10 less expensive, so flip a coin because they are both superb. **–JOSH NOREM**

BENCHMARKS

	Gigabyte GeForce GTX 780 GHz	GeForce GTX 780 (Reference)	EVGA GTX 780 ACX	Radeon R9 290 (Reference)	AMD Radeon R9 290X (Reference)
Driver	331.82	331.58	320.49	13.11	13.11
3DMark Fire Strike	9,695	8,309	9,607	9,108	**9,737**
Unigine Heaven 4.0 (fps)	39	33	**40**	30	33
Unigine Valley 1.0 (fps)	47	38	**53**	36	36
Call of Duty: Ghosts (fps)	**53**	45	51	41	47
Crysis 3 (fps)	**30**	24	27	25	28
Far Cry 3 (fps)	**44**	21	42	25	31
Tomb Raider (fps)	25	20	25	**27**	**27**
Metro: Last Light (fps)	**25**	20	24	10	17
Battlefield 4 (fps)	**47**	46	45	41	45
Batman: Arkham Origins (fps)	**51**	43	49	50	**51**
Assassin's Creed: Black Flag (fps)	30	**46**	34	30	30

Best scores are bolded. Our test bed is a 3.33GHz Core i7 3960X Extreme Edition in an Asus Rampage IV Extreme motherboard with 16GB of DDR3/1600 and a Thermaltake ToughPower 1,050W PSU. The OS is 64-bit Windows 8. All games are run at 2560x1600 with 4X AA except for the 3DMark tests.

VERDICT
9
KICK ASS!

Gigabyte GeForce GTX 780 GHz Edition

➕ **WINDFORCE** Excellent performance; back-and-side plate; very quiet and cool.

➖ **BREEZEFORCE** A little expensive compared to the EVGA card.

$540 (street), www.gigabyte.us

Toshiba Qosmio X75

Lots of graphical horsepower at a reasonable price

IT'S BEEN A WHILE since we reviewed a Toshiba gaming notebook, so we couldn't wait to get our hands on the company's new Qosmio X75. Unlike iBuypower's super-slim and portable 17-inch Battalion M1771 gaming notebook we reviewed last issue, the Qosmio X75 puts power ahead of portability.

With a body measuring 16.5x10.7x1.7 inches and weighing more than seven pounds, the X75 is definitely in desktop-replacement territory. The chassis is clad in black textured aluminum, with lots of red accenting, such as the shiny red trim around the body and the trackpad, the red LED keyboard backlighting, and the glowing red Qosmio logo on the lid. It all serves to add a bit of flash to an otherwise subtle aesthetic.

A couple aspects we don't like are the 4-pin power connector, which necessitates precise orientation of the plug. We're also not crazy about the exhaust fan's location on the right edge, which could mean warm wrists for right-handers during heavy play sessions. While it never got uncomfortably hot, we would have preferred a rear exhaust.

On the bright side, the Qosmio's display is one of the best TN panels we've seen, with fantastic viewing angles and a vibrant 1080p glossy display, which didn't suffer from the usual glare problem. We also had no qualms with the laptop's quad Harman/Kardon speakers, which sounded clear and powerful. As a matter of fact, we can confidently say that these are some of the best laptop speakers we've heard.

The trackpad is similarly praise-worthy. While we normally harp on trackpads that don't feature two dedicated buttons, the Qosmio's uniform expanse is easy to use, with horizontal grooves above the left and right mouse clickers providing a suitable substitute for separate buttons. In addition, the trackpad is ample at 4.5x3.2 inches, highly responsive, and supports multitouch gestures. The keyboard is also equally competent, although we do wish the arrow keys were full-size as opposed to half-size.

Inside the chassis, the Qosmio sports a quad-core 2.4GHz 4700MQ CPU, a GeForce GTX 770M, and 16GB of memory. For storage, it has a 256GB mSATA SSD coupled with a 1TB hard drive. The laptop has a 47Wh 8-cell battery.

When it was time to perform, Toshiba's laptop killed it in the gaming department, but was average everywhere else. We had never reviewed a gaming laptop with a 770M before, and found that it had no issues kicking the crap out of the more mobile-oriented 765M GPU in our Alienware 14 zero-point rig, thanks in no small part to its 3GB of GDDR5 memory. We're talking performance advantages of 17–66 percent in the gaming tests. The Qosmio couldn't quite keep up with our zero-point in our CPU-intensive benchmarks, however, losing by roughly 3–8 percent. While those aren't huge losses, it's still a little disappointing given that both laptops use the same Intel processor. We suspect that Toshiba is throttling the CPU to avoid thermal issues. Thankfully, the laptop never got hot, so we didn't hear much fan noise.

The laptop's biggest failing actually came by way of battery life, which isn't a big surprise from a machine of this size. In our video rundown test, the Qosmio lasted two hours and 20 minutes. If you're interested in getting a laptop this large, you're most likely going to use it as a desktop replacement, thus battery life isn't really an issue. And while its CPU performance is a little disappointing, the Qosmio X75 offers a lot of performance as a gaming laptop for a very fair price. While our build cost $1,800, foregoing a Blu-ray drive and reducing the memory to 8GB of RAM (which is more than enough for gaming) could save $275, bringing the total to a little over $1,500. When you also consider the fact that you can easily pop open the bottom of the laptop for swapping out RAM and storage (without voiding the warranty), the Qosmio X75 turns out to be a great deal for enthusiasts, particularly gamers. –**JIMMY THANG**

BENCHMARKS

	ZERO-POINT	
Stitch.Efx 2.0 (sec)	962	993 (-3.1%)
ProShow Producer 5 (sec)	1,629	1,716 (-5.1%)
x264 HD 5.0 (fps)	13.5	12.4 (-8.1%)
BioShock Infinite (fps)	36.1	47.19
Metro Last Light (fps)	30.4	50.67
3DMark 11 Perf	4,170	4,888
Battery Life (min)	234	140 (-40.2%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point notebook is an Alienware 14 with a 2.4GHz Intel Core i7-4700MQ, 16GB DDR3/1600, 256GB mSATA SSD, 750GB 5,400rpm HDD, a GeForce GTX 765M, and Windows 7 Home Premium 64-bit. BioShock Infinite tested at 1920x1080 at Ultra DX11 settings; Metro Last Light tested at 1920x1080 at DX11 medium quality settings with PhysX disabled.

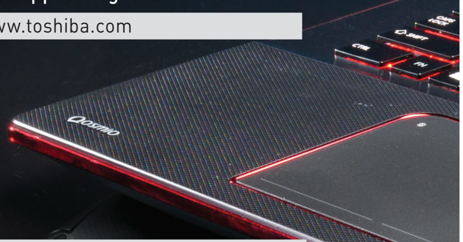
VERDICT **9**

Toshiba Qosmio X75

SHIBA Lots of storage; powerful GPU; excellent speakers; good trackpad; fair price.

SHIH TZU Heat exhaust is aimed at right hand; annoying power plug; CPU performance is disappointing.

$1,800, www.toshiba.com



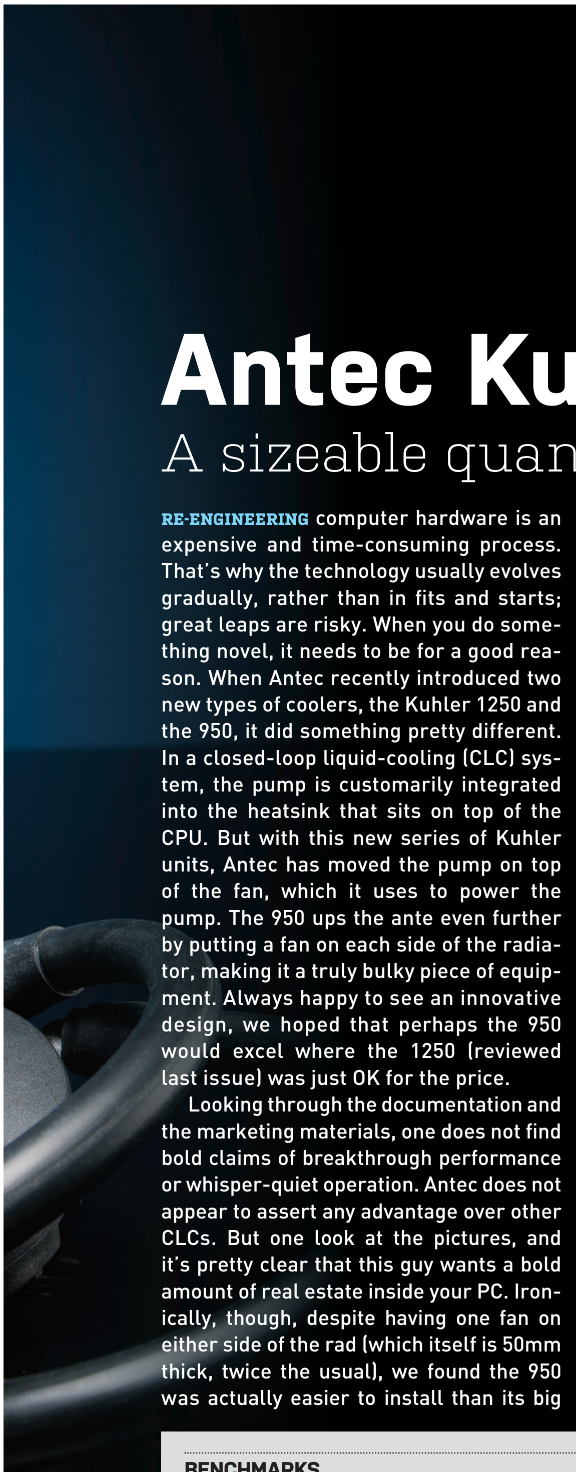
SPECIFICATIONS

CPU	2.4GHz Intel Core i7-4700MQ
RAM	16GB DDR3L/1600
Chipset	Intel HM87
GPU	Nvidia GeForce GTX 770M 3GB GDDR5
Display	17.3-inch 1920x1080 LED display (glossy)
Storage	256GB SSD, 1TB HDD
Optical Drive	Blu-ray burner
Connectivity	Ethernet, VGA, HDMI, all-in-one card reader, 4x USB 3.0, headphone, mic, 2MP webcam, Bluetooth, 802.11n
Lap / Carry	7 lbs, 3.7 oz / 9 lbs, 8.8 oz

Go with 8GB of RAM and forego the Blu-ray drive to save $300.

Despite its mass, this cooler fit in our test bed, as long we installed it in the rear and not the top.

Antec
CE
Antec



Antec Kuhler H20 950

A sizeable quandary

RE-ENGINEERING computer hardware is an expensive and time-consuming process. That's why the technology usually evolves gradually, rather than in fits and starts; great leaps are risky. When you do something novel, it needs to be for a good reason. When Antec recently introduced two new types of coolers, the Kuhler 1250 and the 950, it did something pretty different. In a closed-loop liquid-cooling (CLC) system, the pump is customarily integrated into the heatsink that sits on top of the CPU. But with this new series of Kuhler units, Antec has moved the pump on top of the fan, which it uses to power the pump. The 950 ups the ante even further by putting a fan on each side of the radiator, making it a truly bulky piece of equipment. Always happy to see an innovative design, we hoped that perhaps the 950 would excel where the 1250 (reviewed last issue) was just OK for the price.

Looking through the documentation and the marketing materials, one does not find bold claims of breakthrough performance or whisper-quiet operation. Antec does not appear to assert any advantage over other CLCs. But one look at the pictures, and it's pretty clear that this guy wants a bold amount of real estate inside your PC. Ironically, though, despite having one fan on either side of the rad (which itself is 50mm thick, twice the usual), we found the 950 was actually easier to install than its big brother. The whole assembly cleared the large heatsinks on our Asus Rampage IV Extreme motherboard, which is not known for modesty. Our tall and fancy-looking sticks of RAM also had plenty of room. The 950's immobile pipes that go from the pump to the rad partially obstructed one of the screw holes on the CPU tray bracket, but we were able to angle it in after some fiddling. (Pro tip: Don't fully insert your screws until all four corners of the bracket are attached.)

So far, so good. Next is the cabling. Like the 1250, it's all integrated into the heatsink—if you don't mind using only the bundled "Grid" fan control software to report your temps and speeds. We needed our usual testing tools, so we had to grab a Y-splitter to connect the unit's two fans to one motherboard fan header, in addition to testing with the official installation method. When we linked the fans to the motherboard, though, Grid could no longer "see" the fans. This either-or scenario is a bit vexing, but not a deal-breaker. Most people should be fine with Grid. You can install it from the CD in the retail box, or download it from the product page on Antec's website.

In terms of raw performance, the 950 did not fare as well as we hoped. It regularly outpaced the best air coolers, but it also ran consistently behind top-shelf CLCs (both the 120mm and 240mm variety). Since the design of the cooler is so unconventional, it's difficult to define the source of these underwhelming results. On the plus side, the fans had pretty good noise levels; once the side panel was on, we could barely hear the 950's fans, as long as we weren't running them full-tilt. We don't measure noise scientifically, though, so your mileage may vary.

The difference between this and, say, an NZXT X60 is only a few degrees Celsius. In the real world, you may never take advantage of that additional edge. Every buyer, however, will need to deal with the 950's somewhat-awkward installation and non-removable fan. In the end, the 950 does some interesting things, but it doesn't quite have the performance to make up for its quirks. –**TOM MCNAMARA**

BENCHMARKS

	Kuhler 950 Quiet / Performance Mode	Kuhler 1250 Quiet / Performance Mode	212 Evo Quiet / Performance Mode	Kraken X60 Quiet / Performance Mode
Ambient Air	22 / 22.3	24 / 22.5	20.5 / 20.3	20.9 / 20.7
Idle Temperature	38 / 32.2	35.8 / 31.7	35.5 / 30.5	29.7 / 28.8
Load Temperature	72.1 / 67.7	69.3 / 63.3	70 / 67.3	66 / 61.8
Load - Ambient	50.1 / 45.4	45.3 / **40**	49.5 / 47	**45.1** / 41.1
Price	$100	$120 (street)	$35 (street)	$120 (street)

Best scores are bolded. All temperatures in degrees Celsius. All tests performed with an Intel Core i7-3960X at 4.1GHz, on an Asus Rampage IV Extreme motherboard, in a Corsair 900D with stock fans set to Standard.

VERDICT
7

Antec Kuhler H20 950

➕ **GOLD** Fits better than expected; easy cabling.

➖ **PYRITE** So-so performance; fiddly installation.

$100, www.antec.com

SPECIFICATIONS

Radiator Dimensions (H x D x W)	6.3 x 2.0 x 4.7 inches
Stock Fans	2x 12cm PWM
Socket Support	LGA1150/1155/1156/1366/2011; AM2/AM2+/AM3/AM3+/FM1/FM2
Additional Fan Support	N/A

The Black2 delivers a 120GB SSD and a 1TB HDD in a slim 2.5-inch package.

WD Black2 SSD+HDD

One drive to rule them all

THE WD BLACK2 is an answer to the prayers of mobile users who have just one drive bay but want the speed of an SSD with the capacity of a hard drive. Unlike a hybrid drive, which stores all data on a hard drive but uses a limited amount of flash storage for caching, the WD Black2 features an all-new design whereby a single 2.5-inch enclosure houses both a hard drive and an SSD—two distinct drives that appear to the OS as such, so you can put your OS on the SSD and your data on the hard drive. It's a brilliant solution that unfortunately gives up a bit of performance in order to conform to the small form factor, but if we had just one storage bay in our notebooks, we'd upgrade to this bad mutha immediately.

The drive is a 9.5mm unit, so it won't be sliding into any ultraportables—those require a 7mm drive—but it will fit just fine in a larger notebook. The SSD portion of the drive is a 120GB unit that uses 20nm MLC NAND flash, though the NAND manufacturer is unknown. It utilizes a JMicron controller as well as DRAM onboard cache. There is also a Marvell SATA bridge chip that allows both drives to share the lone SATA 6Gb/s interface. The hard drive portion is a two-platter, 5,400rpm model with 1TB of capacity, and its "Black" designation indicates that it's one of Seagate's "high-performance" drives, but with hard drives we don't expect blistering performance anymore. We'd just like them to not suck too hard, and for mobile duties they need to conserve power, so they don't have very big shoes to fill. The drive includes an outstanding five-year warranty, and is Windows-only at this time, as it requires software to "unlock" the 1TB partition. Once unlocked though, the partition is visible on any system, or at least it appeared on all the Windows machines we connected it to; we did not verify this with a Mac or Linux machine. You can't use two of these drives in RAID, nor can you span data across both partitions.

WD lists the drive's performance specs for the SSD as offering 350MB/s read speeds and 140MB/s write speeds, but it doesn't list any numbers for the hard drive. In our testing we found the SSD to offer slightly faster read speeds, hitting 429MB/s in ATTO, and its write speed of 129MB was very close to spec. That's not as fast as even a midrange SSD, however, so we would not enlist it for heavy usage or any video work. The hard drive portion averaged 114MB/s read and write speeds in testing, which is good enough for data storage but not super impressive. Also, since both drives share a SATA interface, transferring data to both drives simultaneously can cause a traffic jam—we saw read speeds on the SSD drop about 100MB/s when copying data to the hard drive at the same time.

All in all, this drive is clearly a compromise, but one we'd be willing to live with if we were constrained by a single storage bay. The SSD is fast enough, and 1TB of storage is bodacious, as well. If it were faster it would earn a Kick Ass award, but for now we'll probably have to wait until Gen 2 to satisfy all of our desires.
–JOSH NOREM

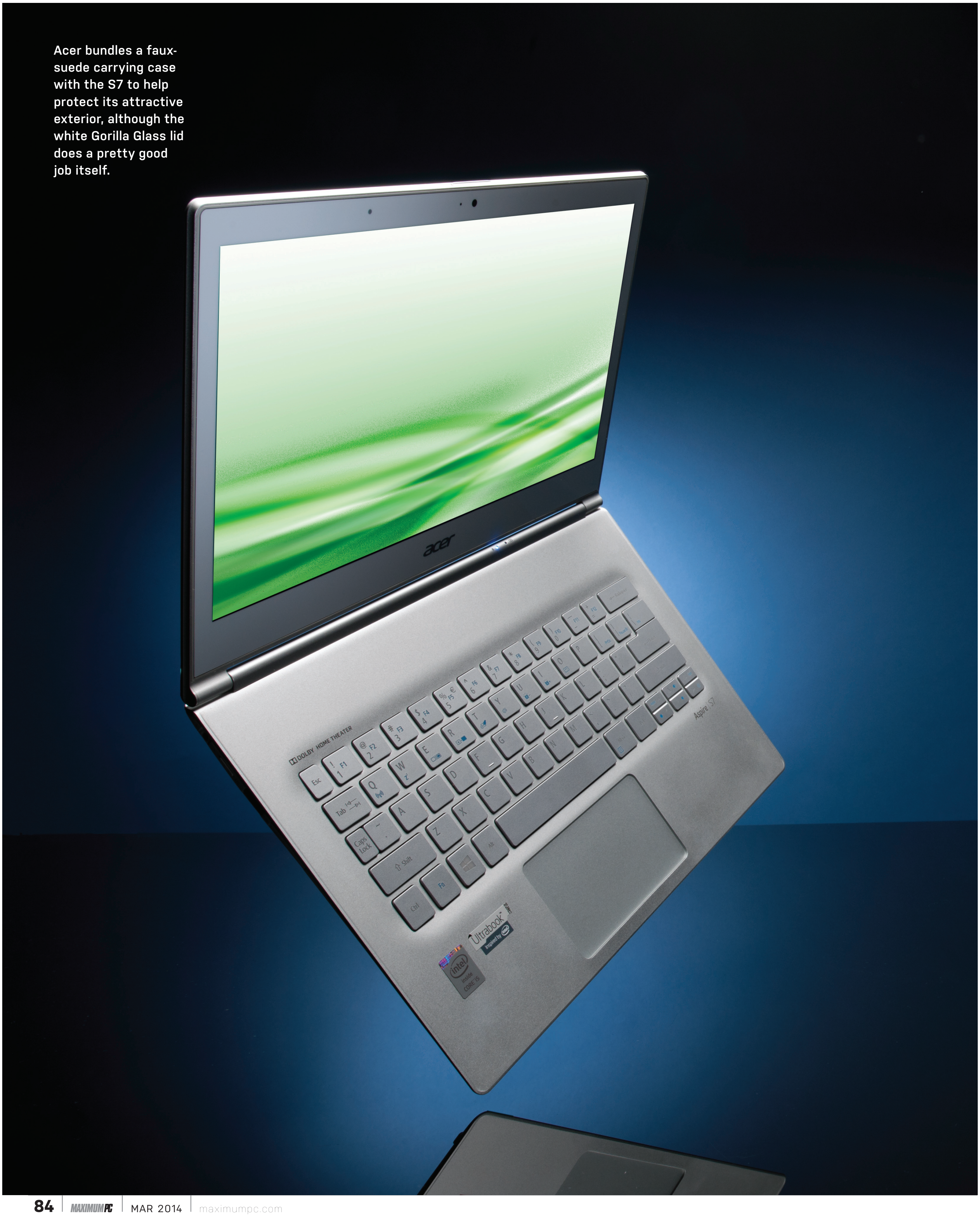
VERDICT
9

WD Black2 SSD+HDD

+ **BLACK DRIVE** Great engineering; speed and capacity; includes SATA-to-USB cable.

− **BLACK EYE** Pricey; SSD is not super-fast.

$300, www.wd.com



Acer bundles a faux-suede carrying case with the S7 to help protect its attractive exterior, although the white Gorilla Glass lid does a pretty good job itself.

Acer Aspire S7

Haswell adds (battery) life to the party

DESPITE HAVING reviewed the original Acer S7 almost a year ago, its nearly identical follow-up is no less impressive to our Ultrabook-weary eyes. As before, we're smitten with the stylishness of the glossy-white Gorilla Glass lid and brushed-metal keyboard and surrounds. And its thin physique (.51 inches) and light weight (2.87 pounds) are still just as deserving of praise. What's really nice about the second-gen Acer S7 is that it retains all of the first model's exceptional qualities but adds some new welcome features, to boot.

In last year's review, we looked at the premium skew of the S7, which cost $1,650. This time we're reviewing the step-down model (S7-392-6832), which trades in a Core i7 part for a Core i5 (Haswell, natch), has just one 128GB SSD versus two, and costs $250 less.

In addition to maintaining the attractive styling, the new S7 also holds onto its 13.3-inch, 1920x1080 glossy IPS screen. Sure, there are portables nowadays with even more pixels-per-inch, but given this screen's size and Windows 8's scaling issues, we don't find the S7's resolution lacking. In fact, we're quite pleased with its crisp picture and wide viewing angles. It's a touchscreen, of course.

An area where change is welcome is the S7's keyboard. In our first review, we complained of the chiclet-style board's shallow keypress, a common side-effect of a super-slim profile. Acer is obviously listening to its critics, because it added some depth to the new S7's keys, making typing noticeably better—without adding any perceptible bulk to the form factor, we might add. The trackpad, which is sizable and smooth enough, still uses Elan software as opposed to Synaptics, our preference. Oh, well.

We also previously remarked on the audibility of the first S7's two fans under load. Acer has addressed that issue, too, revamping its push-pull Twin Air Cooling by reducing the number of fan blades from 29 to 23, thus reducing the noise. We can attest that the S7 is seriously quiet.

A slight throttling of the CPU's clock speed might also play a part in the thermals, which brings us to a discussion of the S7's components. The Core i5-4200U has a base clock of 1.6GHz and Turbo potential of 2.6GHz, although we didn't see it reach peak speeds in our tests—perhaps in an effort to manage temps. So, while our first S7 stood out from the crowd by surpassing our very robust Intel reference Ultrabook in the benchmarks, this S7 falls short of the zero-point scores in nearly every test. To be fair, that's pretty much been the norm with notebooks of this slimness.

What hasn't been the norm is nearly seven hours of battery life. Thanks to the Haswell processor in the new S7, it's the first time the manufacturer's claims for battery life have actually aligned with our test results. We kid you not, the S7 managed to continuously loop 1080p video for a record-breaking seven hours (well, six hours and 54 minutes, to be exact).

Clearly, Acer hasn't taken its eye off the ball where the S7 is concerned, and we applaud the new refinements. Yes, even at its lower price, the Core i5 model is on the high side for many folks, but if you're in the market for a super-portable machine that has the build quality and battery life to go the distance, as well as high-end style, the S7's worth the investment. **–KATHERINE STEVENSON**

VERDICT
9
KICK ASS!

Acer Aspire S7

+ WHITE STRIPES Outstanding style; great battery life; improved keyboard.

− GREAT WHITE Paltry 128GB SSD; we wish the trackpad used Synaptics software.

$1,400, www.acer.com

BENCHMARKS

	ZERO POINT	
Premiere Pro CS3 (sec)	840	960 (-12.5%)
Photoshop CS3 (sec)	100	138.3 (-27.7%)
ProShow Producer (sec)	1,122	1,160 (-3.3%)
MainConcept (sec)	1,901	2,010 (-5.4%)
Quake III (fps)	358.2	332 (-7.3%)
Quake 4 (fps)	76.1	78.9
Battery Life (min)	221	414

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point ultraportable is an Intel reference Ultrabook with a 1.8GHz Intel Core i5-3427U, 4GB of DDR3/1600 RAM, integrated graphics, a 240GB SSD, and Windows 8 64-bit.

SPECIFICATIONS

CPU	1.6GHz Core i5-4200U
RAM	8GB DDR3/1600 dual-channel RAM
Display	13.3-inch 1920x1080 IPS LCD
Storage	128GB SSD
Connectivity	2x USB 3.0, HDMI, headphone/mic input, SD card reader, 802.11n, Bluetooth 4.0, 1.3MP webcam, WiDi, Acer adaptor port.
Lap / Carry	2 lbs, 15.1 oz / 3 lbs, 5.9 oz

Get out the grease; you might have a bit of work ahead of you if you're trying to stuff big parts inside Cooler Master's cramped chassis.

Dream Machine Redux

Spin-offs of old case favorites square off

Ah, Cooler Master and Corsair. We know you well, especially since the cases we're checking out here are derivatives of cases that have previously been featured in *Maximum PC*'s annual opus, the fabled Dream Machine.

Here's a spoiler, though: We're not likely to pick either one for next year's big build. We're pretty impressed with Corsair's offering, but a few quirks in design keep this strong case from achieving a better score. As for Cooler Master, it's time to take the Cosmos SE back to the drawing board, unless you fancy a game of "Honey, I Shrunk My Components." –**DAVID MURPHY**

COOLER MASTER COSMOS SE

Maybe we're spoiled, but the phrase "full-tower chassis" tends to evoke a certain image in our minds—a sense of space, in particular. We hear "full-tower" and we think *beaucoup* room: tons of empty mounts for hard drives and 5.25-inch devices, lots of room in which to work and move around (and string cables throughout), as well as a super-easy installation for parts and pieces—one that doesn't feel like you're trying to wedge a very expensive square into a round hole.

Perhaps Cooler Master should have reconsidered calling its Cosmos SE chassis a full-tower, because to us, the description seems a bit stretched. Sure, there's plenty of room for storage. The case supports no fewer than eight 3.5-inch hard drives or a whopping 18 2.5-inch drives (assuming you're slapping two SSDs into each of the case's eight total drive bays). Six of these drive bays can be removed *en masse* if you want to stash a radiator in place or, annoyingly, if you need a bit more room for your graphics card.

That allows us to segue into our primary criticism of the chassis: It's cramped. To the company's credit, Cooler Master does specifically call out the exact measurement of graphics cards that the case supports on its website. However, it does so using the measurement taken if the aforementioned drive bays are removed (15.5 inches in length, if you're curious). When the bays aren't removed—and frankly, we wish we didn't have to remove them, as they're both more useful and aesthetically pleasing than a large, gaping hole—you only get 10.9 inches of clearance for GPUs.

To put that in real-world terms, it felt as if we were on the verge of damaging our 10.5-inch Nvidia GeForce GTX 480 video card when wedging it—literally—into the case. We eventually got it in, but it left absolutely no room between the edge of the card and the hard drive bays. You're then totally reliant on the cable-routing holes cut into the tray itself to power up your card, which isn't saying much.

Adding to the space concerns of this already-tight chassis is the fact that installing a common ATX motherboard (using provided standoffs; they aren't preinstalled) blocks a portion of two of the case's primary, rubberized cable-routing holes—and, of course, they're the ones closest to the video card you've just hammered into the case. The case's top-mounted 14cm fan covers half of a routing hole on the top of the motherboard tray, as well.

If you have anything beyond a standard PC setup, you're going to have quite a bit of hassle getting your cable management to work correctly in this case; we sure did. The case does come with two large holes near the power supply, but you sacrifice case aesthetics when you have to route cables right overtop your parts—at least, we didn't like the picture we were seeing through the case's large side-panel window when doing this workaround.

Cooler Master packs plenty of preinstalled cooling into the Cosmos SE. We wish we had a built-in fan controller to reduce the din (and keep us from having to string a ton of Molex connectors together).

We almost wish Corsair's case came with an additional drive bay for SSDs; the trays on the case's rear don't quite fit.

It doesn't, however, pack in locking mechanisms for your 5.25-inch devices; you have to screw those in manually (hello, five years ago). Two USB 3.0 connections join two USB 2.0 connections on the front, in addition to a button that manually controls the case's blue LED lighting (from the fans).

But really, that's just dressing up a pig at this point. We'd recommend the Cosmos SE only to those who like meticulously measuring out all their parts and pieces before doing a build. The other 99 percent of you would do well with a chassis that works *for* you, not against you.

VERDICT 5

Cooler Master Cosmos SE

$170 (street), www.coolermaster-usa.com

CORSAIR 750D

Militaristic in its precision, Corsair's 750D chassis is all about business, not adornments. You won't find any fancy lighting on this case, nor an inordinate array of preinstalled, pretty cooling for a case of this size. What you do get is a ton of space to work with: plenty of room for cable management, video cards of all sizes, liquid-cooling support for a triple-fan radiator (3x 12cm), and then some. While the case offers plenty to begin with, you could theoretically add even three *more* drive bays to the interior without it feeling cramped in the slightest.

As you might expect, the 750D fits just about any motherboard you throw its way. The simple ATX mobo we use for our testing felt a bit like Jack in the land of the giants; screwing it into the preinstalled standoffs was easy, and we loved that it was surrounded by a total of eight holes for cable routing (five rubberized, three cut into the top-side of the elevated motherboard tray). While you might lose one or two of these holes if your power supply is larger than five inches long, that still leaves a considerable amount of room to play with.

If you're rocking an extended power supply, Corsair makes it fairly easy to remove the three-bay drive cage that stands in your path and relocate it above the similarly sized drive cage on the case's bottom-right. We were a little surprised that this wasn't the 750D's default configuration, as it feels like one has an unnecessary surfeit of room around the graphics card area on the motherboard when both drive cages adorn the case's bottom.

That said, the default arrangement does allow for a good amount of uninhibited cooling to churn from the case's two front 14cm fans. A single 14cm fan gives a bit of exhaust on the case's rear; given the 750D's size, however, we'd prefer a larger 20cm variant on the case's top, which could help boost cooling while simultaneously cutting out a bit of noise in the process.

While it might sound like we're gushing over the 750D's design, there are still a few quirks that keep this case from "killer" status. For starters, Corsair slaps four drive trays for SSDs on the right side of the chassis, directly blocking the rear of the 3.5-inch drive cage (or cages, depending on your configuration). It's a pain in the butt to route cables and manage storage on the drive cages if you have all four 2.5-inch trays filled with SSDs.

While installing an optical drive into one of the three free 5.25-inch bays isn't that bad (you have to pop off a front panel from behind and slide the drive in) the optical drive doesn't actually sit flush against the covers. It ends up being recessed just a bit, which makes for a not-so-impressive aesthetic on the case's front.

Additionally, the case's top is literally a rubber filter magnetically locked into place atop the grilled aluminum. If you're not kicking up the cooling (air or liquid), you might not even notice this; still, it feels like a flimsy afterthought for one of the parts of the case that you're most likely to be staring at (whatever you do, don't rest a drink on the chassis).

These misgivings are still minor detractions from an otherwise excellent chassis. The 750D is big, fairly easy to work with, and offers a great arrangement for all but the most tricked-out systems, storage-wise.

VERDICT 8

Corsair 750D

$160 (street), www.corsair.com

NeatConnect allows up to 50 documents in the loading tray at once.

Neat Company NeatConnect

Eliminating paper clutter, one scan at a time

CONSIDER THE GROWING pile of paper on your desk. Yes, most of it will be tossed in the trash or end up lost behind your file cabinet along with coffee coasters and PCIe brackets. The Neat Company aims to tidy your work surface with its NeatConnect, a wireless scanner that digitalizes your documents and organizes them into its cloud filing system.

This isn't the first scanner we've tested from the Neat Company, but it's the first scanner we've tested that uploads files directly to the cloud without the use of any software on your PC. NeatConnect even allows you to directly upload to your favorite cloud-storage services, such as Dropbox, SkyDrive, Evernote, Box, and Google Drive. But even given the option to upload files to other cloud storage sites, the NeatCloud is the best way to maximize value from NeatConnect.

The NeatCloud is the most attractive feature in this package, allowing users to manage files and quickly retrieve information. NeatCloud automatically scans receipts and business cards to extract valuable data, such as total cost and contact information. After the document has been scanned, the image and corresponding data is stored as a record in a folder. NeatCloud also allows users to query records for expense reports or to search for documents easily—perfect if you're managing at-home expenses or a small business.

NeatConnect features a sleek white cover; slot sizes for business cards, receipts, and documents; and a small touchscreen interface in the center. The device measures 11x8.7x7.5-inches and weighs just 5.3 pounds. NeatConnect supports SD cards and features one USB port on the back, for the direct transfer of PDF files onto your PC, albeit only in black-and-white when using this method. While color and various file formats are an option for cloud storage, NeatConnect is designed for document scanning, not photo scanning. In fact, the Neat Company does not recommend using the device to scan photos because it may damage them; if you're looking to digitalize your photo albums, look elsewhere.

Installation is a no-brainer. Upon boot, the scanner requires an 802.11 b/g/n connection and a NeatCloud account, which can be created on the spot. Like today's smartphones, NeatConnect guides you through short tutorials and then lets you begin scanning. The touchscreen interface enables you to save scans onto the device itself, your PC, NeatCloud, or other cloud storage services. NeatConnect also enables files to be sent via email directly. The touchscreen interface enables a variety of scanning options including color, grayscale, or black-and-white scans. You can also enable single-sided or double-sided scanning, separate or bundled files, DPI resolutions of 150, 200, 300, or 600, and popular file extensions such as PDF, TIFF, and JPG. The Neat Company sports iOS and Android apps, allowing you to upload a photo on the go or to view files in the NeatCloud.

We like the NeatConnect's intuitive interface, mobile app, and great cloud service, but picking one up will set you back a cool $500. After three months, NeatCloud charges users $6 per month for the baseline service. If you find that you're managing home- or small-business expenses and are looking for a great way to quickly organize and retrieve information, the NeatConnect is a worthy investment. **–CLARK CRISP**

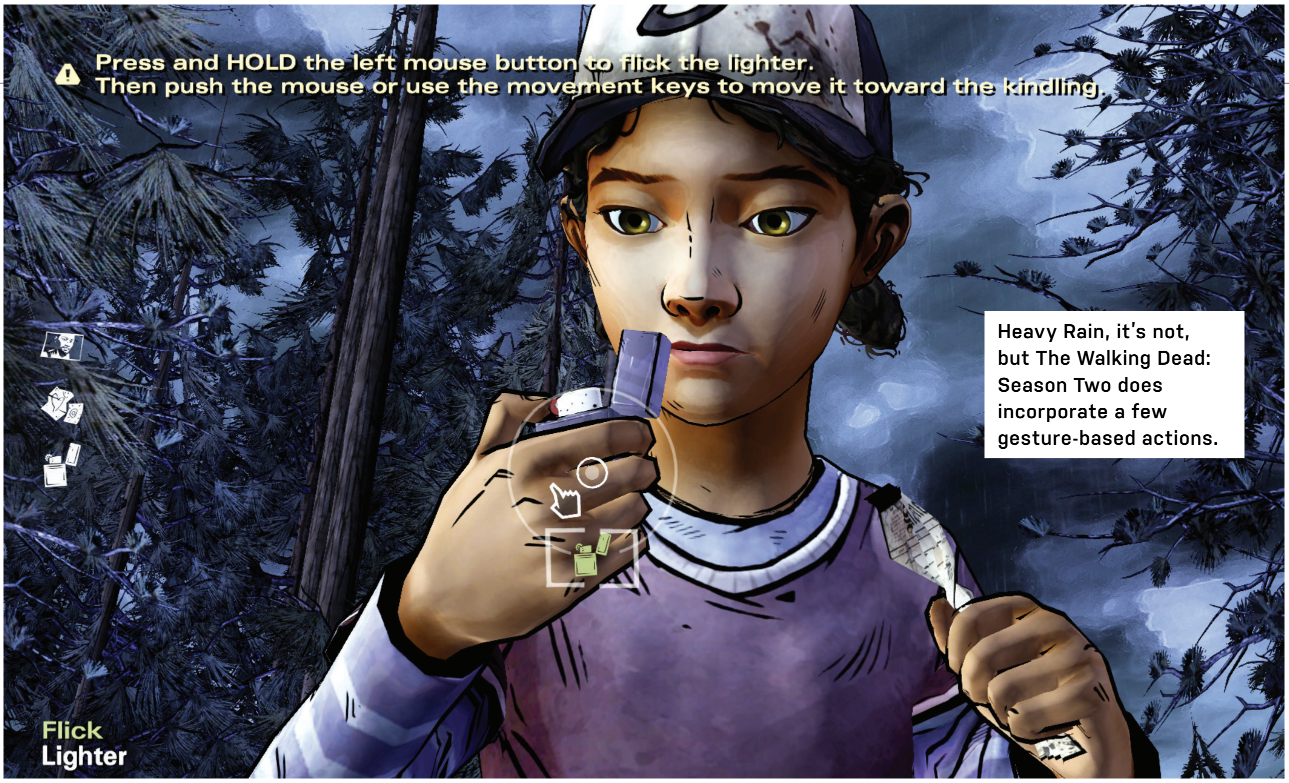
VERDICT
8

Neat Company NeatConnect

+ TIDY AND WELL-KEPT Great software; clean, intuitive interface.

− PAPER MONSTER Expensive; scans to PC only in PDF.

$500, www.neat.com



Press and HOLD the left mouse button to flick the lighter.
Then push the mouse or use the movement keys to move it toward the kindling.

Heavy Rain, it's not, but The Walking Dead: Season Two does incorporate a few gesture-based actions.

The Walking Dead: Season Two

We would have befriended the cat instead

WE REASON there are a number of you who have *heard* of The Walking Dead, but have never gotten a chance to exercise your mouse fingers in this quasi-game. This has led us to wonder: Is the second season of Telltale Games' The Walking Dead compelling enough to make one go through the entire series up until this point? Could you even jump back in if you had a peek at Season One but never quite got around to finishing it?

We'll make this decision easy: Yes, you should buy the second season of The Walking Dead.

If the thought of investing roughly 13–15 hours or so to catch up in Season One doesn't sound all that appealing, Telltale has you covered. Since the game is based on choices, Season Two can automatically import the key decisions you made in the game's previous season. Even if you only finished a chapter, your decisions can have an impact on your Season Two life—anything you didn't get to in the first season is automatically randomized by the game for you.

That said, it's important to realize that The Walking Dead is good at giving players the illusion of choice. For example, you're going to get attacked by a dog in All That Remains no matter how you interact with the beast. It's rare that your actions will have a significant, Choose Your Own Adventure–like major impact on your future. You'll still go through the same overall plot, it's just some of the details might vary based on your actions.

A word about that: We love the game's interactive storytelling, and there's no doubt that it does force you to make some fairly emotional choices. We even found ourselves empathizing in different ways and varying our character's mood depending on how an NPC was treating us. Still, the general pacing within these episodes feels a bit formulaic: You have a larger exploration section where you click a lot of stuff or talk to a lot of people, typically followed by a dangerous scenario that requires a reflexes-or-death reaction, followed by a larger "pick one of two big things that happen" section. Wash, rinse, repeat.

Your character, Clementine, struggles to survive in a zombie-infested world—a gripping, gritty narrative featuring a great balance of quick-timing interactive elements and passive (albeit simplistic) exploration. The action bits feel more vivid and natural in Season Two, and we want to kiss the designer who thought it best that the interactive clues you point-and-click on disappear once you've performed the action (they persist in Season One, leading to much description repetition).

The Walking Dead is more of a sitcom than a game (humorously enough, given the game's roots can be found in a TV series). What it lacks in clickable depth, it more than makes up for in story and narrative delivery. The Walking Dead isn't very complex; you can guess *how* the story will be told, but the game's twists—dictated in part by you, the player—keep it fresh and engaging.

Astute *Maximum PC* readers will note that we have yet to devote a paragraph to The Walking Dead's plot, unlike the style of most of our game reviews. It's not just because you control many elements of the story—no, you owe it to yourself to enjoy this survival adventure to the spoiler-free fullest, however you decide to do it. **–DAVID MURPHY**

VERDICT
9

The Walking Dead: Season Two

+ ZOMBIE (CRANBERRIES) Lovely comic visuals coupled with super-easy interactivity; twist-and-turn-filled storyline; minor tweaks from Season One benefit gameplay tremendously.

– ZOMBIE PROM Formulaic narrative structure; occasional graphics issues; individual choices could more significantly affect story branching.

$25, www.telltalegames.com, ESRB: M

LAB NOTES

KATHERINE STEVENSON **EDITOR-IN-CHIEF**

Hasta La Vista, Loyal Readers

It's been a blast

AFTER NEARLY 14 years, and some 154 issues (give or take), I'm hanging up my Lab coat and moving on. When I first started working at *Maximum PC*, I was an innocent Mac-using copy editor just looking for a foothold in publishing. I never could have predicted that I would stick around this long. But then again, how could I not? I've had the extreme pleasure of working with an exceptional group of smart and fun-loving people over the years, on such an exceptional product—shoot, after just a couple issues, I couldn't help but become a diehard PC fanatic. It's been an honor to be part of *Maximum PC*'s history, and I will truly miss all the hijinks (and hardware!), as well as the loyal readers. Fortunately, I'm not going too far. I will continue to work for Future US, heading up the US edition of *Mollie Makes*, a magazine aimed at enthusiast crafters. So, if you're looking to crochet a mouse cozy or embroider a CPU pinout chart, you know where to go for instruction. Thanks for all the memories!

Quad Booting: How to install 4 OSes on 1 PC
The Palm IIIc: Your favorite PDA —now in color!
Spying Software: How to nab slacker employees red-handed
Pentium III Notebook Showdown
MAXIMUM PC
MINIMUM BS
MAY 00
1GHz
IT'LL BLOW YOUR MIND!
We're talking 1000 MEGAHERTZ!
DOUBLE THE POWER of last year's best processors!
It's a FREAKING SUPERCOMPUTER on a single chip!
WE ROAD-TEST THE FASTEST STREET-LEGAL CPU OF ALL TIME!
AMD K7 PROCESSOR
imagine MEDIA WITH PASSION
$7.99 US $8.99 CANADA

My first issue: How far we've come!

JIMMY THANG

Online Managing Editor

The PC rocked CES this year. The highlight of the show was Valve's unveiling of 13 Steam Machines, many of which were in small form factor (SFF) chassis that looked awesome. It wasn't all about SFFs, however. CyberPower's lunchbox-shaped Battle Box and Origin's highly configurable Genesis case proved there is still plenty of room for innovation with larger cases. And then there were innovative PC gaming devices like the updated Oculus Rift and PrioVR virtual-reality suit. Finally, the biggest surprise of the show was Razer's highly modular Project Christine PC. This year, my friends, is going to be a good year for the PC.

Josh Norem

Senior Editor

I spent this month applying aftermarket coolers to our Radeon R9 290X. Since the stock-cooled card runs at 94 C, I was curious to see how much of a difference an aftermarket cooler could make. First up was Sapphire's Tri-X triple-fan card, which kept the overclocked GPU at a chilly (compared to stock) 75 C under load while being almost silent. Next, NZXT's G10 adapter (strapped to a $100 CPU cooler) kept it even cooler, never letting it get above 52 C. If you thought the R9 290X was just a hot GPU, it's not. The reference cooler is just not very good, apparently.

First Look: NZXT Kraken G10 GPU Bracket

Attach any Asetek-based CPU cooler to your GPU

WITH THE proliferation of closed-loop coolers these days, there is a bounty of options for those wanting to liquid-cool their CPUs. However, very few options exist if you want to liquid-cool your GPU. NZXT is hoping to change that with its G10 adapter, which will let you attach any Asetek-based liquid cooler to a wide range of GPUs made in the past few years. That includes the NZXT Kraken X40 CPU cooler, as well as models from Corsair, Antec, Thermaltake, and Zalman. The G10 adapters are available in red, white, and black, and cost just $30. A liquid cooler will set you back about $100 bucks, so this is not a cheap upgrade, but it's still less expensive and time-consuming than investing in a custom loop. The G10 also includes an onboard fan to cool the voltage equipment on your GPU, which is a nice touch. It comes with a two-year warranty, but NZXT warns that removing the stock cooler from your GPU will likely void the card's warranty, so proceed with caution.

The G10 fits all the latest GPUs from both AMD and Nvidia except for a few lower-end models that cost less than the cooler. There are some AMD GPUs that use a recessed die though, such as the HD 7970, and we found this out the hard way, by trying unsuccessfully to mount the cooler to a PowerColor HD 7970 Vortex II without a shim, which costs about $4 online. After seeing the GPU hit 100 C within one second of load activity, we dismantled the cooler to find the water block was unable to make contact with the GPU, so we decided to switch to our Radeon R9 290X reference board.

Installation took about 30 minutes and was surprisingly painless. We unscrewed the stock cooler and lifted it off the board, attached the backplate with four screws poking through the PCB, then lowered the cooler onto the GPU die by dropping it through a metal ring that holds it in place. Once four nuts were secured to the corresponding screws, the G10 was in place. Installed, the G10 has a few cables coming out of it that need to be connected, including a cable with two female fan headers on it—one goes to the VRM fan, and the other to the fan cooling the radiator. One large plug goes into a USB header on the motherboard, and provides power for the pump.

When we attached the Kraken X40's 140mm fan to our case (be sure the CPU cooler and fan you buy fits your case; another hard lesson we learned in this experiment) and turned it on, we could hear the liquid making its way through the system. Our Radeon R9 290X idled at about 40 C, but how it performed under load was simply astonishing. This card normally runs at 94 C, but with the G10 installed it never rose above 52 C. We installed the Kraken Kontrol software and were able to customize the fan curve to our liking, view pump and fan speeds, and control the system parameters quite easily.

Overall, our first impression of the G10 is that it's quite impressive, and we were blown away by how effective it was in handling this notoriously hot GPU. It was also totally silent for the most part—making this one hell of an upgrade. Tune in next month as we dive deeper in our full review. **–JN**

You'll need to buy the CPU cooler separately, then attach it to the G10 adapter.

GEEK
TESTED &
APPROVED

Perixx Periboard 805L Folding Bluetooth Keyboard

If you're a mobile device user who's been frustrated with onscreen text input, there's always Bluetooth keyboards. But they're way too bulky to carry around… right? Well, German company Perixx has a BT keyboard that folds in half to measure about 6.25 inches long, less than 4 inches wide, and just a little under 0.75 inches thick. It's small and light enough to fit into a pants pocket, unless you're the skinny-jeans type.

You pair it like you do with any other mobile device, but you may be asked to enter a six-digit code on the keyboard to authorize. In Android 4.4, at least, the keyboard could navigate the OS, in addition to performing text input. The fold causes some awkward button placement, but it's not a deal breaker, in our opinion. The standardized, 31-inch Micro USB charging cable is also a nice touch, and the price is reasonable. $35 (street), www.perixx.com **–TM**

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

> Military Shooters
> TLC NAND
> Windows 8.1

The Reality of War

The List, in your January 2014 issue, of the "9 Best Military-Themed Shooters" is pretty good, but what caught my eye was your remark concerning America's Army: "It's easily the most realistic, being developed by the Army itself." That's kind of like saying something must be true because the government told us it was. I would be more inclined to believe that the most realistic shooter isn't the one the Army developed, but more likely the one that the U.S. Army, U.S. Marine Corps, as well as the militaries of several other countries use to train their service members. The shooter I'm referring to is Virtual Battlespace (VBS), which was developed by Bohemia Interactive. The current iteration of VBS that is in use by the Army is VBS2 v2.0 with VBS3 slated for release in 2014.

I have several years of experience developing scenarios for VBS2 and assisting Army units in utilizing VBS2 to train their soldiers on a variety of tasks. As I remember, America's Army was developed as a tool to help with recruitment, but VBS was developed to train soldiers. I would suggest that a more realistic shooter than America's Army is VBS2 and by extension another shooter, which was on your list and also developed by Bohemia Interactive, ARMA 2. While I'm not an expert on ARMA, I do know that it and VBS share a lot of things in common. VBS does have a lot added to it and adjusted for use by the military, but these two shooters share the same DNA.

— Rob Wheale

ONLINE MANAGING EDITOR JIMMY THANG RESPONDS: We're glad you enjoyed our list. And thanks for informing us of the VBS series, we'll have to check it out. In regard to your comment, we weren't saying America's Army is the most realistic shooter ever made, but that it is arguably the most realistic shooter on our list. While the series has gotten more arcade-ish over time, we do like the fact that it takes you through a robust training course and sends you to jail if you shoot your commanding officers. Still, we agree with your opinion that ARMA 2 is indeed also very realistic.

SSD vs. HDD, Round 29

When I built my system two years ago, SSDs were still too small and pricey. Now that prices have started to come down, I'm curious to know how two Regular 7,200rpm hard drives in Raid 1 compare to an SSD? With the smallish capacity of SSDs, why not just buy two HDDs and run in Raid 1?

—Thomas Clair

SENIOR EDITOR JOSH NOREM RESPONDS: We are entering the golden age of SSDs, Thomas, and now is a great time to invest in one for your OS, as prices are affordable, and performance is incredible, at least compared to mechanical drives. To answer your question, though, two drives in RAID 1 won't be much faster than a single drive, since RAID 1 just copies everything to the second drive for redundancy. Two drives in RAID 0, however, can approach an SSD in sequential-read and -write speeds, but they will never, ever be able to match an SSD's almost-instant seek times, and thus will "feel" much slower to you in your everyday PC usage. Those two drives will also create a lot of heat and noise, which is another area in which SSDs are untouchable.

Windows 8.1: Not Convinced

I read your Skeptic's Guide to Windows 8.1 (January 2014). It was very informative, and it has convinced me that I will *never* purchase Windows 8. Taking it further, I will not purchase a computer containing it, either. I have read article after article on how to cope with the debacle called Windows 8. Don't you see anything wrong with that concept? I personally don't desire the tablet/touchscreen experience, and I never will. I don't want big, clunky "App" tiles cluttering my desktop. I don't purchase "Programs" from an app store, and there are millions like me. What the hell is an app, anyway? Microsoft has taken it on itself to decide what we want or need to purchase! If there are freeware programs that return much of Windows' functionality, do you mean to tell me that the mighty Microsoft couldn't provide them natively? How hard would it be to program the ability to select your desired interface on first startup? Copies of Windows 8 would have flown off the shelves if Microsoft had done that, but in an act of ultimate arrogance, the company decided that we should buy it and like it. When Microsoft restored the Start button that doesn't do anything, I interpret that as, "Here is your damn Start button, now shut the (bleep) up." If any other industry followed that business model, they would go under in record time. Now, I know there are people out there who own a tablet/touchscreen and are happy with the OS, and I am happy for you, but can't regular desktop users get

↘ submit your questions to: comments@maximumpc.com some love, too? We shouldn't have to cope with or adapt to something Microsoft wants us to purchase.

Thanks to *Maximum PC*, though, for another excellent article.

—G. Knipe

What Were You Thinking?!

Maximum PC lost credibility by giving Windows 8.1 an 8 verdict (January 2014). A fair rating would be 2. Windows 8.1 is half-baked crapware just like Windows 8. In this day and age, is it really asking too much of a desktop operating system to let users adjust the size of all fonts? The control panel should have a checkbox to disable and hide all the cloud integration features in Windows 8 and Office. Windows Store (Metro) apps have potential, but I don't like that Windows 8.1 provides no way for a user to disable a particular app's access to the Internet. This creates a needless security and privacy risk for users.

—Shiv Patel

WINDOWS 8.1 REVIEWER DAVID MURPHY RESPONDS: While it is a bummer that you can't change font sizes as easily as in previous Windows versions, Windows 8.1 does allow you to universally change the size of *everything* (fonts included) through the Screen Resolution options (in Control Panel > Display). You also get some control over the font sizes of some, but not all, Windows 8.1 items. To remove Internet access for particular apps, try editing your settings using Windows' built-in firewall.

As for the cloud (SkyDrive), please check out the Doctor's response to the letter titled "GoodbyeDrive" on page 19.

TLC-gate

I have been a loyal subscriber to *Maximum PC* since at least 1997 and have relied on your reviews for upgrades to my PC. In July 2013, you gave Samsung's 840 Evo 1TB SSD a 9/Kick Ass verdict. You were like children who used to wave red flags and cheer Chairman Brezhnev in Red Square, buying into a lie. You failed to warn your readers that this was TLC NAND, and I forked over $600 for it. Oh, sure, as long as I don't edit or transcode videos and just do general computing, it will outlast an HDD, but I spend good money for future-proofing my rig. I should have read Anand Lal Shimpi's review because he laid bare the truth. Why can't you do the same?

—Rainys Andrew Blekaitis

SENIOR EDITOR JOSH NOREM RESPONDS: After we got your letter, we looked at Anand's (AnandTech.com) review of the Samsung 840 Evo. In it, he estimates that if you wrote 50GB of data each day (a high-usage scenario is just 10GB), the 840 Evo would last 63 years, noting, "I put together the table [outlining the lifespan] to put any fears of endurance to rest." He concludes by awarding the drive his "Recommended by AnandTech" award, so we're semi-confused about the "truth" you say he is laying bare. In our opinion, your fears of TLC being unreliable are wholly unfounded by real-world testing. Tech Report just wrote 500TB to a TLC Samsung 840 drive, and it's still running. It would take you umpteen years to get to 100TB on any SSD, and Anand himself notes that endurance is not a concern on this drive. However, you are correct in that we called the NAND MLC when it is indeed TLC. We noted it's 3-bit MLC, aka TLC, but should have been more clear. That said, we have never heard of a Samsung TLC drive wearing out its flash in the real world, so you should be just fine with the drive for many, many years to come.

[NOW ONLINE]

STEAM CONTROLLER PREVIEW

The real star of the Steam Machine's hardware lineup is Valve's innovative Steam Controller. While no controller can ever replace the precision and speed of a keyboard-and-mouse combo, this is arguably the best gaming controller yet, with its two awesome trackpads and responsive haptic feedback sensors. Valve says that it will support every Steam game out there. Check out Gordon's hands-on impressions of it here: http://bit.ly/controlmpc.

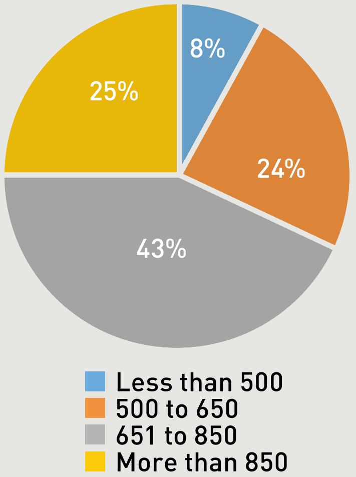
Facebook Polls

What's Your Cheapskate Tip?

In honor of this month's Cheapskate's Guide, we asked our ever-knowledgeable Facebook fans to contribute their strategies for saving dough. Here are some of our favorite responses.

Alex Tomala: PCpartpicker is a great resource when creating builds.
Ben Atwell: Buy your GPU in the second year.
Jeff Humphreys: Always check Steam for deals; never buy games at release for full price.
Seth Izen: Use free open-source software instead of proprietary whenever possible.
Chris Loiselle: *AMD*
Kevin Morgan: One word—Linux! All the good software is free, too.
Dustin Lai: You don't need a ton of RAM, and 4–8GB will work for most applications.
Peter Richardson: Track bank specials. I get cash back at Tigerdirect and Monoprice right now.
Nathan Medlock: Sign up for the Humble Bundle mailing list.
Ryan Hoffman: You can get Office free/cheap if you're a student, or if you work for a midsize or larger business.
Travis Bakos: Don't go cheap. Buy good stuff and save money by not replacing it.
Peter Richardson: Target will price-match Amazon.com in-store.
Rory Drake: Monoprice.com for cables.
Kamel Kamel: Don't get married or have children.
John Smith: Don't buy a Mac.

How Many Watts Is Your PSU?



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THE BUILDS

BUDGET

INGREDIENTS

PART		PRICE
Case	NZXT Source 210 Elite	$50
PSU	EVGA 100-B1-0500-KR 500W **NEW**	$40
Mobo	ASRock 970 Extreme3 R2.0 ATX	$70
CPU	AMD FX-6300	$110
Cooler	Cooler Master Hyper 212 Evo	$35
GPU	Asus Radeon HD 7790 2GB **NEW**	$144
RAM	2x 4GB G.Skill Ripjaws DDR3/1333 **NEW**	$64
SSD	Kingston HyperX 120GB SSD SH103S3/120G	$90
HDD	Seagate Barracuda 1TB	$61
OS	Windows 8 64-bit OEM	$100

Approximate Price: $764

AMD'S FX-6300 CPU retains a high price-to-performance value, so we're sticking with it for at least another month. The ASRock mobo was also on sale this month, so it stays, too. We did swap some other parts though, since RAM prices keep creeping up and the Radeon HD 7850 video card has been officially retired. We switched our RAM to G.Skill 1,333MHz sticks, and ditched the HD 7850 for a HD 7790 since the performance loss will be very small. We did have to pay $30 more for this GPU than the previous one though, so we had to drop the optical drive to keep the price steady. The PC Power and Cooling PSU we used last time is no longer on sale, but this EVGA unit has a good rep.

BASELINE

INGREDIENTS

PART		PRICE
Case	Corsair Vengeance C70	$110
PSU	Thermaltake SP-750M 750W **NEW**	$90
Mobo	Gigabyte G1.Sniper Z87 **NEW**	$160
CPU	Intel Core i5-4670K	$227
Cooler	Cooler Master Hyper 212 Evo	$35
GPU	EVGA GeForce GTX 760 02G-P4-2765-KR **NEW**	$250
RAM	2x 4GB G.Skill Ripjaws F3-12800CL9D-8GBXL	$70
Optical Drive	LG GH24NS95	$15
SSD	Crucial M500 240GB	$150
HDD	Seagate Barracuda 1TB	$61
OS	Windows 8 64-bit OEM	$100

Approximate Price: $1,268

INTEL REIGNS SUPREME at the enthusiast level, so we're sticking with the Core i5-4670K, which has a great balance of price and all-around performance. (The Core i7-4770K mostly just adds Hyper-Threading, so we couldn't justify the extra $100 or so.) The Gigabyte Z87X-UD3H board we used before has gone up in price while the G1.Sniper Z87 has come down, so we switched since it has better onboard sound and is easier to overclock. We are still using a GTX 760, because it's in the sweet spot of price and performance, and great for 1080p gaming. We switched the PSU from the 750W NZXT HALE82 to shave off a few bucks, and Thermaltake's "Smart M" series power supplies are great, so we're happy to have one powering our baseline build.

PERFORMANCE

WE ORDINARILY reserve 240mm/280mm liquid-cooling for our Ultra build, but expandable loops like the Cooler Master Glacer 240L and the Swiftech H220X are starting to create an all-new super-high-end tier. So, we've upgraded from our 120mm Corsair Hydro H80i to the 240mm H100i. It's more appropriate for a $2,500-range PC, anyway. The difference in performance won't be huge, but the larger radiator of the H100i should allow for slower fan speeds and a quieter experience.

We could upgrade the CPU to a Core i7-4930K, which has two more cores than the i7-4820K we're using, but we can't justify the extra $250. You may feel differently if you regularly use workstation apps that benefit from a lot of CPU threads, like HD video encoding, and we may feel differently when Intel drops its eight-core Haswell-E CPUs toward the end of the year.

The Radeon R9 290X would be a great alternative to the GeForce GTX 780 Ti, since it's almost as fast and costs $150 less, but as we go to press there is a global shortage of cards and they are impossible to buy.

For more of our component recommendations, visit www.maximumpc.com/best-of-the-best.

INGREDIENTS

PART			PRICE
Case	NZXT Phantom 530		$130
PSU	Seasonic M12II 850W		$126
Mobo	Asus Sabertooth X79		$315
CPU	Intel Core i7-4820K		$314
Cooler	Corsair H100i	**NEW**	$100
GPU	EVGA GeForce GTX 780 Ti		$700
RAM	4x 4GB Corsair Vengeance DDR3/1600	**NEW**	$150
Optical Drive	Asus BW-12B1ST		$60
SSD	Samsung 840 Evo 500GB		$325
HDD	Seagate Barracuda 3TB		$109
OS	Windows 8 64-bit OEM		$100

Approximate Price: $2,429

UPGRADE OF THE MONTH
COOLER MASTER GLACER 240L

The Glacer gets our vote this month, not just because it performs well, but because it's expandable. If you buy it and decide to liquid cool a GPU later on, you won't have to buy a second kit, since you can just extend the 240L loop using standard G1/4-inch fittings.

$140, www.coolermaster-usa.com

MAXIMUM PC (ISSN 1522-4279) is published 13 times a year, monthly plus Holiday issue following December issue, by Future US, Inc., 4000 Shoreline Court, Suite 400, South San Francisco, CA 94080. Phone: (650) 872-1642. Fax: (650) 872-2207. Website: www.futureus.com. Periodicals postage paid in San Bruno, CA and at additional mailing offices. Newsstand distribution is handled by Time Warner Retail. Basic subscription rates: one year (12 issues) US: $19.95; Canada: US$24.95; Foreign: US$34.95. Canadian and foreign orders must be prepaid. Canadian price includes postage and GST (GST #R128220688). PMA #40612608. Subscriptions do not include newsstand specials. POSTMASTER: Send changes of address to Maximum PC, PO Box 5852, Harlan, IA 51593-1352. Standard Mail enclosure in the following editions: None. Ride-Along enclosure in the following editions: None. Returns: Pitney Bowes, PO Box 25542, London, ON N6C 6B2, Canada. Future US, Inc. also publishes @Gamer, Crochet Today!, Mac|Life, The Official Xbox Magazine, and PC Gamer. Entire contents copyright 2014, Future US, Inc. All rights reserved. Reproduction in whole or in part is prohibited. Future US, Inc. is not affiliated with the companies or products covered in Maximum PC. Reproduction on the Internet of the articles and pictures in this magazine is illegal without the prior written consent of Maximum PC. Products named in the pages of Maximum PC are trademarks of their respective companies. PRODUCED IN THE UNITED STATES OF AMERICA.